Brink's BODY BUILDING Revealed

by Will Brink

Muscle Building Diet
50 Supplement Reviews
Bodybuilding Workouts
The Mental Aspect

With Members Only Forum
& Bodybuilding Tools

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Brink's Bodybuilding Revealed
by Will Brink

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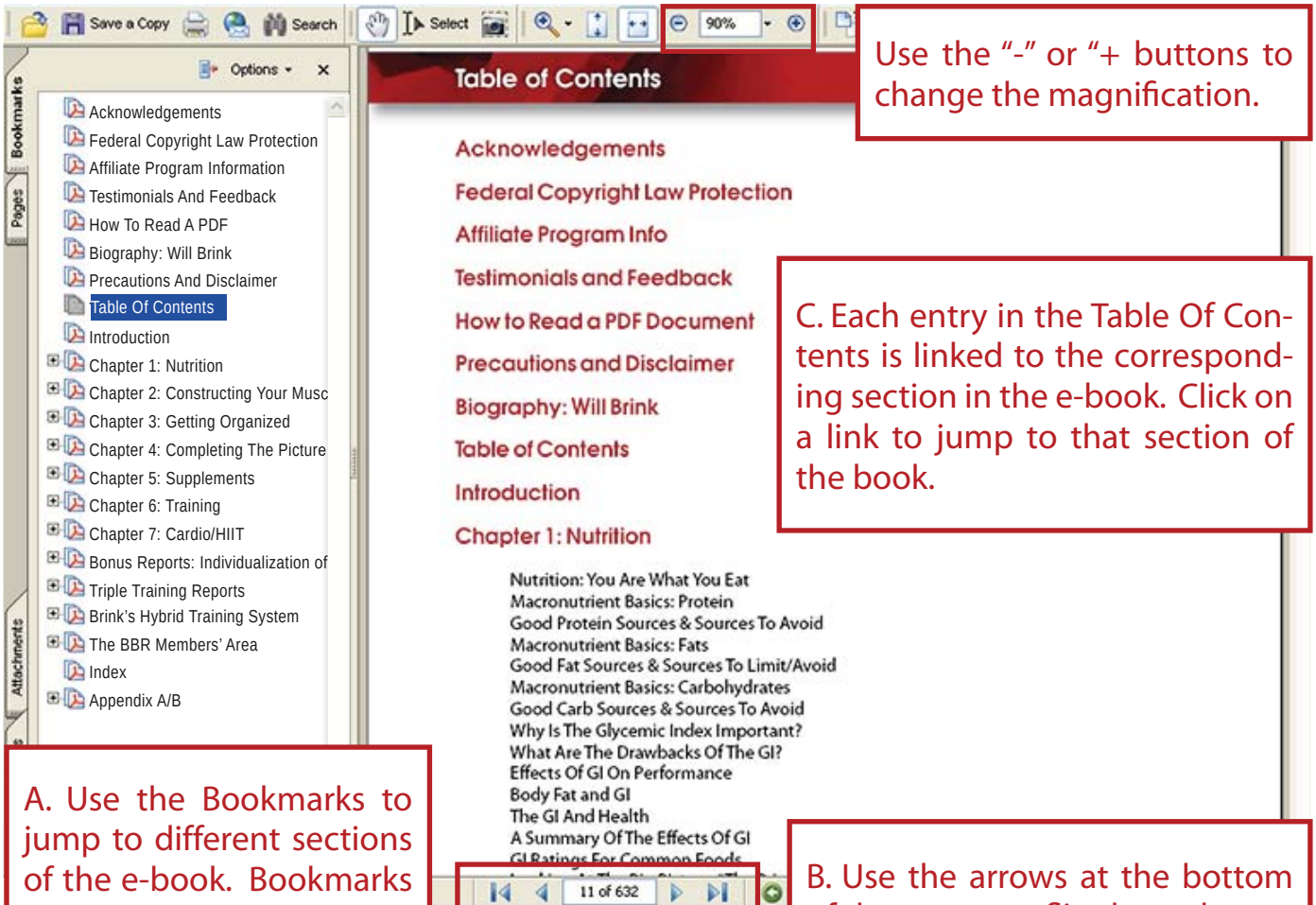

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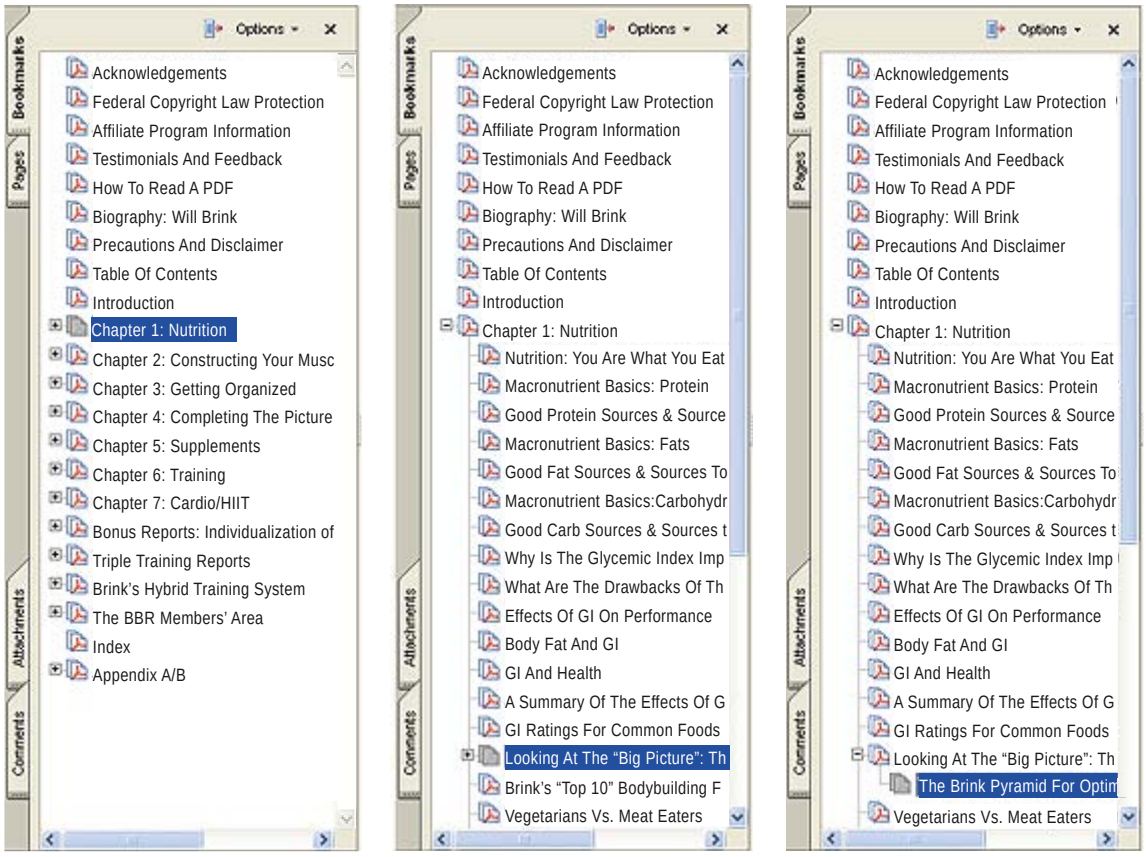

Biography: Will Brink

Will Brink is a columnist, contributing consultant, and writer for numerous health/fitness, medical, and bodybuilding publications. His articles on nutrition, supplements, weight loss, exercise and medicine can be found in magazines and journals such as "Lets Live," "Muscle Media 2000," "MuscleMag International," "Life Extension," "Muscle & Fitness," "Inside Karate," "Exercise for Men Only," "Oxygen," "The Townsend Letter For Doctors," as well as many others.

Will Brink is the author of the book "Priming The Anabolic Environment: A practical and Scientific Guide to the Art and Science of Building Muscle," as well as various chapters in sports nutrition-related textbooks and the e-books "Fat Loss Revealed" and "Brink's Bodybuilding Revealed."

Will graduated from Harvard University with a concentration in the natural sciences, and is a consultant to supplement companies.

He has served as an NPC judge and as a Ms. Fitness USA judge. A well-known trainer, Will has helped many top level bodybuilders through all facets of pre-contest and off-season training. He has also worked with athletes ranging from professional golfers, fitness contestants, and police and military personnel.

His articles and interviews can be found on many internet web sites such as: LEF.org, Testosterone.net, NavySeals.com,ThinkMuscle.com, MuscleMonthly.com, as well as many others, including his own site BrinkZone.com.

Will has co-authored several studies relating to sports nutrition and health published in peer-reviewed academic journals.

His monthly column on supplements, "The Intake Update," is one of the most popular features in MuscleMag International.

Will has lectured at trade associations and universities around the United States and has appeared on numerous radio and television programs to examine issues of

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Introduction

Return to T.O.C.

This e-book covers the three major topics that anyone concerned with adding mass and strength wants to know about: nutrition/diet, supplements and training. Put together, this e-book is just about the most comprehensive and up-to-date manual for adding muscle available today - in print or online.

The chapters that follow cover the steps you need to take to realize your goal: adding muscle mass with a minimum of body fat. The reader will quickly learn this is not another "Gain 100 lb. of monster muscle with my never seen before secret nutrition plan passed down from generations of Eastern monks who developed this system over 2000 years ago," or some such nonsense.

This plan was not smuggled out of an Eastern Bloc country during the Cold War. Nor was it given to me by aliens, or even invented in a super secret lab in the bowels of the CIA designed to make super soldiers.

This e-book is planted solidly on modern science, combined with good old-fashioned common sense, real world experience and years of practice with hundreds of different bodybuilders and other athletes. Although it looks great in advertisements trying to sell you their "techno functional ultra repartitioning sub micron weight gain plan," the CIA is not needed to gain quality weight.

Gaining quality weight is a process of obtaining proper knowledge about the foods needed, following the right ratios for those foods, deciding on the calories required, and being methodical with your plan. Consistency, as much as anything, is why some people get the results they want while others fail. Of course, being consistent with a poor plan and a lack of knowledge regarding calories needed, macronutrient ratios, etc. is a sure route to failure.

In this book, you will be given the foundational knowledge you need to set up a highly effective plan for gaining quality weight, while leaving the bells and whistles of those over-hyped plans to the suckers… err, I mean people, looking for the easy way to success without doing any hard work. Success in any endeavor in life worth undertaking requires hard work. Anyone who

tells you otherwise is full of it.

Of course, no plan designed to gain quality weight will be of any real use without an equally well thought out weight training program. Without weight training, no plan designed to add muscle will do anything but add blubber to your frame. Without giving the body a stimulus (i.e. weight training) for synthesizing new muscle, excess calories - no matter how "clean" - will only increase your body fat. Combine the information in Chapters 1 - 4 with the workout plans in chapter 6, or with Charles Poliquin's bonus workouts. Be consistent with both, and results will be yours.

Chapter 5 covers most of the supplements currently on the market. Though I have attempted to cover virtually all the compounds sold as bodybuilding/sports nutrition supplements, it would be impossible to cover them all. Dozens come out on an almost a weekly or monthly basis.

Most are a rehash of the same old junk that didn't sell well before. Also, there is an overlap with many supplements. For example, carnitine is often sold both as a bodybuilding supplement and as a diet supplement, whereas supplements that (allegedly) boost testosterone are generally kept exclusively in the bodybuilding arena.

Other supplements, such as CLA, have also crossed over into both weight gain and weight loss markets, since this supplement is supposedly able to both add muscle and to reduce body fat. I do not cover supplements sold exclusively for weight loss, such as ephedrine. This book is about gaining weight, not losing it. People interested in supplements for losing weight should refer to my other e-book "Fat Loss Revealed".

Although you will be much more knowledgeable about the supplements sold to bodybuilders and other athletes after reading Chapter 5, it does not mean you will be happier for it. Many people get angry when their knowledge bubble is burst. They are much happier living in ignorance over a topic than having the veil lifted from their eyes, exposing the often-ugly truth. And the truth is that (drum roll) most of what people buy for bodybuilding supplements in an attempt to add muscle are crap, junk, BS, and other expletives I could use.

Sorry, but that's the way it is. It's also been my experience that people tend to blame the messenger for the message. Don't get mad at me if you find out that one of your favorite supplements is a product of marketing (read lacking in any real science) and - contrary to the ads they run will not "add mounds of muscle until your buddies don't even recognize you." Short of an Anadrol enema, no nutritional supplement is going to do that for you. As the man said, "no one ever went broke underestimating the intelligence of the American public."

However, using Chapter 5 to make educated decisions regarding the supplements you buy, will result in a potentially huge savings in money (quickly justifying the cost of this book) and will definitely help you gain the quality weight you seek.

With that introduction, let's begin…

Will Brink

Chapter 1: Nutrition

Nutrition: You Are What You Eat

Return to T.O.C.

To most people, understanding nutrition is only slightly less confusing than understanding Einstein's theory of relativity. A new book or article comes out weekly espousing the latest, greatest way of eating.

What this chapter concerns itself with is giving the reader a foundation for understanding nutrition with the goal of optimizing your body's anabolic environment. What does that mean exactly?

Bodybuilders and other athletes have come to use the term "anabolic" to mean the building of muscle. This is only partly true. For example, physiology or nutrition texts will normally define anabolic or "anabolism" as the phase of metabolism in which simple substances are synthesized into the complex materials of living tissue or a process by which larger molecules are formed from smaller ones.

What does this mean to the reader in plain English?

When you are in an anabolic state you rarely, if ever, exclusively build muscle. It is unavoidable that some body fat will be added to the equation.

Total beginners and people using copious amounts of various drugs (i.e. anabolic steroids, growth hormone, etc.) can put on lean body mass (LBM) almost exclusively at times, but this is the exception, not the rule. Have you ever seen a pro bodybuilder in person off-season? They are proof that - even with large amounts of drugs - to add new LBM, adding some body fat is a reality. The pros that do try and stay hard (say under 8 - 9% body fat) year-round also find their gains in LBM are slow to non-existent. If that's how it is for them with drugs and great genetics, how do you think it works for you?

So, for most, the trick is to maximize, as much as possible, adding LBM, while minimizing the addition of body fat.

People need to understand that body fat % is a ratio. By optimizing LBM gains, the small amount of fat gained can be easily cut - ultimately leaving them with a larger ratio of LBM to fat. When all is said and done, you can reduce your body fat percentage by increasing LBM even if you never lose

an ounce of the fat you started out with.

Example:

A 200 lb. person starting a gaining cycle with 15% bodyfat.

200 lb. x .15 = 30 lb. fat; 200 lb. - 30 lb. = 170 lb. lean mass

Let's assume he adds 16 lb. of lean mass + 4 lb. of fat (20 lb.) This person will now be 220 lb., with 34 lb. fat and 186 lb. lean mass.

That 4 lb. of additional fat can easily be shed in 2 short weeks of moderate dieting with no loss of LBM.

220 lb. - 4 lb. = 216 lb. (186 lb. LBM + 30 lb. fat
30 lb./216 lb. = 0.139 = 13.9%

Even though the person in this example still has the same 30 lb. of fat he started with, his body fat percentage has dropped from 15% to 13.9%., due to the increase in lean body mass.

"That is the ultimate goal of this chapter; to be low in jargon and high in useful "real world" information to maximize gains in muscle, while minimizing gains in body fat."

That is the ultimate goal of this chapter; to be low in jargon and high in useful "real world" information to maximize gains in muscle, while minimizing gains in body fat.

There are three major factors that will dictate whether or not a person will gain muscle mass: genetics, form of exercise (i.e. weight training), and diet.

Without any of the three being optimized, gains in lean body mass will be minimal or non-existent. At the very least, the gains in LBM will be sub-optimal at best.

Unfortunately, we have essentially no control over the first, which is your genetics. A well-known quote in bodybuilding circles is, "the most important way to guarantee success in bodybuilding is to pick the right parents!" In truth, modern science is not far away from being able to turn "on" certain genes that are responsible for a variety of functions in the body.

This development would lead to more LBM – such as increasing protein synthesis via up-regulating the production of some hormone or growth factor – but that is some years off and not the focus of this chapter.

This leaves us with nutrition and training. With the proper knowledge of both, we can maximize results within our genetic limits. Even if you'll never be a bodybuilder or fitness model, you can still add a significant amount of lean body mass. The result will be an enhanced physique, along with improved health and strength.

The focus of the next two chapters is to lay the foundation for proper nutrition when the goal is to increase LBM, while minimizing increases in body fat. After reading these chapters, the reader will understand the fundamentals of how to set up a proper diet for gaining lean mass, macronutrients, some basics on metabolism, calculating protein, carbs, fats and total calories, basic effects of foods on hormones, etc.

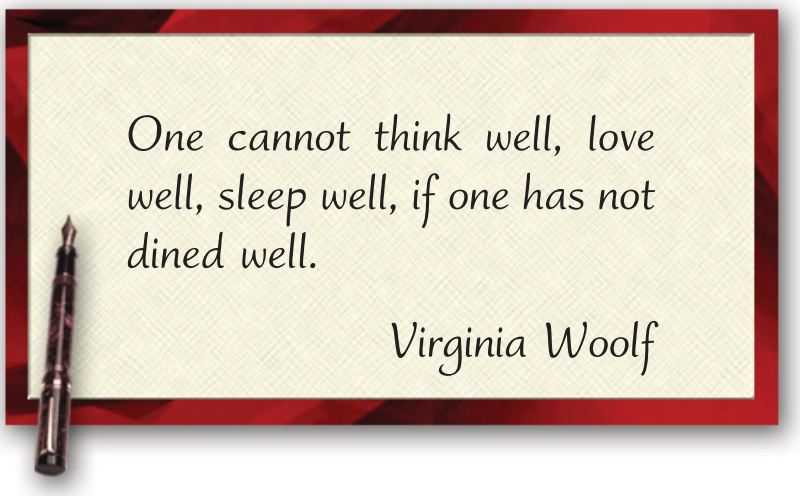
What will be covered:

- Macronutrient basics (protein, fat, carbohydrates): what the food you eat is composed of.
- How the food you eat is utilized by your body. Protein, carbohydrates, and fats all have different effects on your metabolism.
- Optimal food choices: the best food sources for building LBM.
- Macronutrient percentages: how to calculate the proportions of protein, carbohydrates and fats in your diet for gaining lean mass.
- Calorie calculations: determining daily calorie intakes for active people who want to gain lean body mass while limiting fat.
- Nutrient timing: how to spread calories and macronutrients throughout the day for optimal effects on metabolism and muscle growth.
- Pre- and post-workout nutrition: how to combine carbohydrates and protein to enhance the ability of exercise to stimulate muscle growth.

Although the information here is primarily concerned with calories and macronutrients (e.g., protein, carbohydrates, and fat), bear in mind that mi-

cronutrients are important too. Foods are also sources of fiber, vitamins, minerals, antioxidants and other bioactive compounds - some of which haven't even been identified yet. It goes without saying that your best food choices will be found among whole or minimally processed foods. Vitamin pills and other supplements should be considered as additions to - not replacements for - the nutrients available in foods.

Understanding the basics of the macronutrients is important, since a fundamental knowledge of what we eat every day only adds to our ability to make proper choices. Proper choices mean the right amount and types of proteins, carbohydrates and fats in the right ratios.



Macronutrient Basics: Protein

Return to T.O.C.

There are approximately 20 or so amino acids that can make up a protein. Eight of them are considered essential and the body cannot make them on its own (the definition of an essential nutrient), thus they are required from our diet. Technically, the non-essential aminos can be made from the essential aminos. There are also amino acids considered "conditionally" essential under certain conditions and or populations.

If you link several aminos together you get a peptide. Keep linking peptides together and you get a protein. The shape of the individual amino acids and resulting proteins is quite unique and highly specific, so I won't go into great detail here. Suffice it to say, amino acids are the structural unit of a protein molecule.

Protein (or more appropriately, amino acids) is the only macronutrient that supplies nitrogen to drive lean tissue growth (anabolism). Although athletes usually focus on the effect that protein has on skeletal muscle, it is equally important for people to understand that there are other disposal sites of amino acid nitrogen in the human body.

In simple terms, these include structural proteins, DNA, RNA, phospholipids, enzymes neurotransmitters, and bile acids, to name a few. The bottom line is that there are many uses for protein in the body unrelated to just building muscle.

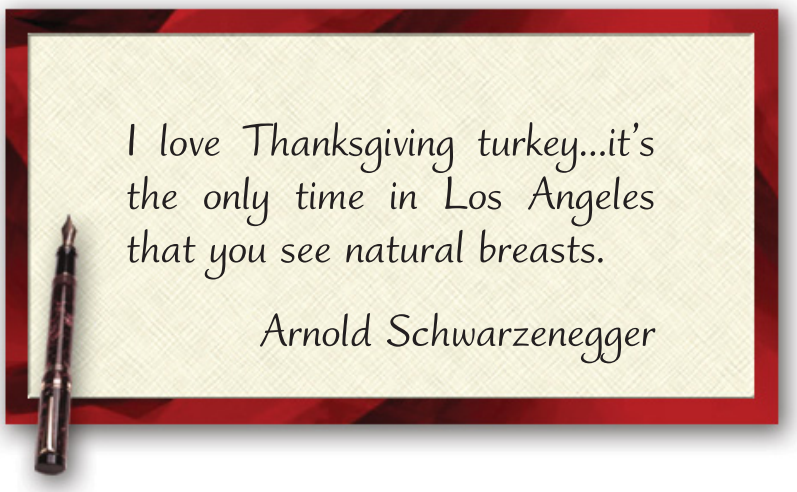
We need protein to build or regenerate skeletal muscle. However, many people don't understand the other functions protein has within the body, as alluded to above. Upon digestion, amino acids from ingested proteins enter what is called the "free amino acid pool." The amino acids can then be diverted to different areas of the body for utilization depending on what the body needs. For example, some amino acids are used as an energy source through their conversion to glucose, using a process called gluconeogenesis.

Others are used to synthesize proteins in many different tissues. Dietary protein can also be converted to fat, though this is a very inefficient process in humans and is not a major source of body fat, contrary to what you may have been led to believe by some nutritional "authorities."

Protein is also a very thermogenic fuel substrate in the body, meaning that its digestion, metabolism and storage require a great deal of energy, which is released as heat. Have you ever wondered why you may feel hot after a large protein meal? This could be the reason.

Protein is the macronutrient that's least likely to turn to fat. In fact, it has been shown that ingesting large amounts of protein can account for upward of 20 percent of daily energy expenditure. This means that as much as 20 percent or more of the calories from protein you eat are lost as heat and can't be stored as fat on your glutes or hips!

"From a thermal, hormonal, and biochemical point of view, protein is the least likely macronutrient to be converted to body fat."



Good Protein Sources & Sources To Avoid

Return to T.O.C.

Good Protein Sources	Proteins to Limit/Avoid
Lean cuts of beef	Luncheon meats/hot dogs
Whey protein powder	Whole milk
Skinless chicken	Ground beef
Salmon/Tuna/Sardines	Ham
Low fat cottage cheese	Cheese
Egg whites	Bacon
Turkey breast	Pork Chop
Tuna and all other fish	Yogurt

Note that the "good" sources of protein are all from animal sources. Animal proteins are complete: that is, they contain all of the essential amino acids in amounts that our bodies can use efficiently to build our own proteins. There are many sources of plant proteins as well, such as soy, legumes, nuts, seeds, and grains, but these are incomplete: they are low in one or more of the essential amino acids. They are also not as concentrated a source of protein as meat and other animal proteins are.

I have nothing against vegetarians, but people who want to gain muscle are better off eating animal proteins. To read more about this, see the section on "Vegetarians vs. Meat Eaters."

Another point: the good sources of protein are low in fat. While it's important to get a range of fats in the diet, it's possible to get too much of a good thing. When choosing a protein source, we want most of the calories it provides to be from protein, not fat.

To discuss protein further, you can post in the Members' Area.

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Macronutrient Basics: Fats

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Fats are deceivingly simple molecules. Fats are just atoms of carbon linked together in a chain. Assuming nothing is attached to either end of the chain (a free fatty acid), you will find a carbon surrounded by hydrogen (CH_3) on one end, and on the other end you will find a few oxygens (COOH or COO-).

Surrounding all the carbons are hydrogen atoms. Now what gives various fats most of their biological character is the length of the chain and the number of double bonds. The more carbons, the longer the chain. A double bond is what you get when you take away a few hydrogens and the bond "doubles up" on the carbon (see picture). These double bonds are very important and dictate (along with the length and shape) the type of fat and its effect on the body.

For example, a fatty acid chain with no double bonds is said to be "saturated" and is known as a saturated fat. These are fats that are hard at room temperature. Although much maligned, saturated fats do have a place in the diet of athletes, as will be explained later in this chapter. Put a single double bond in the fat and it is a "monounsaturated" fat. It becomes a "polyunsaturated" fat, as you make more double bonds.

Olive oil is an source of monounsaturated fat, and oils such flax, corn, soybean, etc. are sources of polyunsaturated fats, as they have multiple double bonds. The more unsaturated a fat is, the lower melting point it has - so these fats are liquid at room temperature.

Highly unsaturated fats such as those in fish oil actually remain liquid at very low temperatures. This is why cold water fish have high levels of these lipids (fats).

Saturated fatty acid: (caproic acid)

$$CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}COOH$$

Figure 1. A polyunsaturated fatty acid (linoleic acid)

$$CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH{=}CH\text{-}CH_2\text{-}CH{=}CH\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}COOH$$

Like the essential amino acids, the body has two essential fatty acids it cannot make itself – due to a lack of the necessary enzymes – so they must be supplied by the diet and are aptly called the "essential fatty acids" or EFAs.

The two EFAs are linoleic acid (LA) and alpha-linolenic acid (ALA). LA is known as an "omega-6" fatty acid and ALA is known as an "omega-3" fatty acid. Minimum requirements for the essential fatty acids are 3 - 6% of daily calories for LA and 0.5 - 1% of daily calories for ALA. Sources such as flax, hemp, and perilla oils contain significant amounts of ALA, while safflower, sunflower, and grapeseed oils are high in LA.

As with many vitamins and minerals, it is difficult to get optimal amounts of unprocessed essential fatty acids (especially the omega-3 fatty acids) from our heavily processed food supply. The term "omega-3 fatty acid" should ring a bell for the reader.

Fish oils are a well-publicized source of the omega-3 fatty acid metabolites, EPA and DHA, which our bodies make from ALA and has been shown to have many benefits. Although early research told us we need a bit more LA than ALA, in practice, I find that a diet higher in ALA produces the best results for athletes looking to build muscle with minimum increases in body fat.

Americans tend to get their fats from saturated fats, rancid fats, and highly processed fats (which contain by-products such as trans fatty acids), thus, giving fats a bad name. EFAs are not to be avoided as a "bad fat" because all fats are not created equal.

From a general health standpoint, EFAs are involved in literally thousands of bodily processes essential to our health and general well being. Immunity, aging, hormone production and hormone signaling... well, you get the point. As one would expect, EFAs have been found to have many health uses including cholesterol reduction, possible cancer prevention and the treatment of inflammatory conditions.

"From a general health standpoint, EFAs are involved in literally thousands of bodily processes essential to our health and general well being. Immunity, aging, hormone production and hormone signaling... well, you get the point."

In particular, the omega-3 fatty acids are anti-lipogenic (block fat storage), anti-catabolic, and anti-inflammatory. They also increase beta-oxidation (fat burning!), improve insulin sensitivity, increase thermogenesis and do a whole lot more that we don't have the space, time, or need, to cover in this chapter.

Recent research has found that EFAs, in particular the omega-3 lipids, control gene transcription. Omega-3 lipids appear to have the unique ability to enhance thermogenesis and thereby reduce the efficiency of body fat deposition.

For the more technically adept: omega-3 lipids play essential roles in the maintenance of energy balance and function as fuel partitioners. They do this by directing glucose toward glycogen storage and directing fatty acids away from triglyceride synthesis and assimilation - thus aiding fatty acid oxidation (fat burning).

EFAs exert their effects on lipid metabolism and thermogenesis by up-regulating the transcription of uncoupling proteins and increasing the encoding for genes that produce enzymes involved in fatty acid utilization; while down-regulating the transcription of genes encoding for enzymes involved in lipid synthesis, such as fatty acid synthase (FAS).

A lack of EFAs, especially the omega-3 EFAs, appears to be one of the dietary factors leading to the development of obesity and insulin resistance seen in Syndrome X. Syndrome X is a process whereby the body becomes resistant to insulin. The result is a long list of health problems, such as weight gain, heart disease, high blood pressure and full blown diabetes.

Of particular interest, the body makes compounds called prostaglandins – as well as other highly unsaturated compounds – from both of the essential fatty acids. Prostaglandins are highly active, short-lived, hormone-like substances that regulate cellular activities on a moment to moment basis.

Prostaglandins are directly involved with regulating blood pressure, inflammatory responses, insulin sensitivity, immune responses, anabolic/catabolic processes and hundreds of other functions known and yet unknown. To sum up without going into a long and boring biochemical explanation: omega-3 fatty acids are responsible for forming anti-inflammatory prostaglandins and omega-6 fatty acids are responsible for many of the pro-inflammatory prostaglandins (in addition to the many other

"A lack of EFAs, in particular the omega-3 EFAs, appears to be one of the dietary factors leading to the development of obesity and insulin resistance seen in Syndrome X."

products derived from EFAs).

Obviously, it's a lot more complicated than that, but hey, I only have so much space to write and I see that glassy look in your eyes that tells me it's time to stop with the jargon...

It is probably easy to see from just reading this section that the metabolism of EFAs is quite complicated. Needless to say, the proper use and understanding of EFAs is important to maximizing your anabolic environment while keeping body fat to a minimum.

Although simple and much maligned, fats are involved in literally thousands of functions in the human body from hormone production, to immunity, to brain function, and countless others. Every single cell in our body is surrounded by a lipid layer and our brains are made mostly of lipids. Some additional information on fats and their functions in the human body, as related to health and performance, will be covered later in this book.

To discuss fats further, you can post in the Members' Area.

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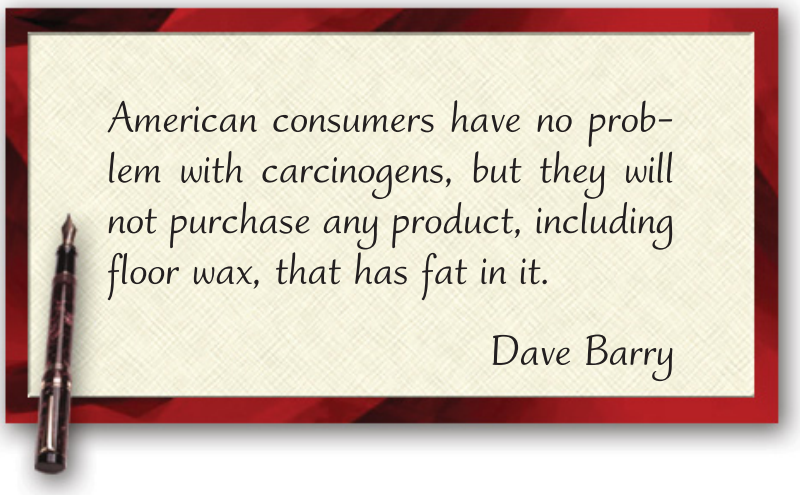
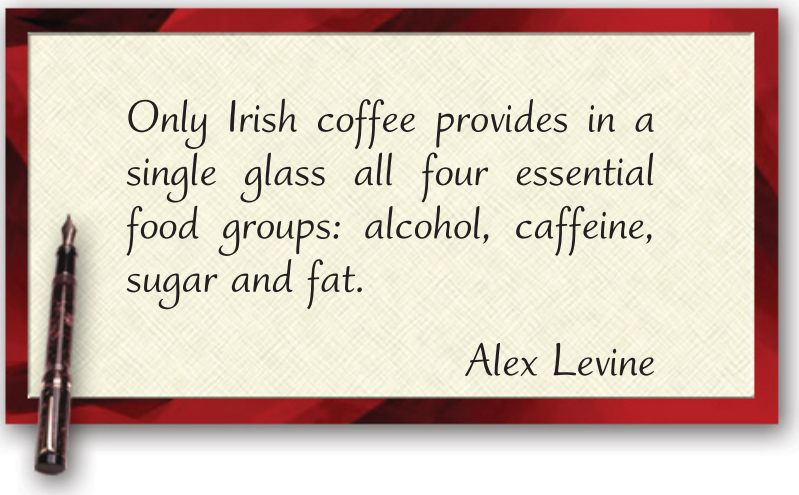


Good Fat Sources & Sources To Limit/Avoid

Return to T.O.C.

Good Fats	Fats to Limit	Fats to Avoid
Flax oil	Butter	Fried foods: any kind
Udo's Choice Oil (omega 3 & omega 6)	Saturated fats (from red meat, cheese, etc.)	Partially-hydrogenated vegetable oils
Fish Oil		
Cold-pressed, unrefined vegetable oils	Mayonnaise	Margarines
Perilla oil	Macadamia nuts	Processed cooking oils
Olive oil	Peanut butter	
Almonds	Sunflower seeds	
Walnuts		
Flaxseeds		
Avocado		
Salmon		



Macronutrient Basics: Carbohydrates

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Carbohydrates, or sugars, are made primarily of carbon, hydrogen and oxygen atoms that cyclize into a ring.

Carbohydrates can be "simple" or "complex" depending on the number of rings you hook together and the way in which they hook together. Though the rings can be slightly different, their common theme is the ring structure as their final shape.

Similar to amino acids and fats, when you link the simple units (the sugars) together you get carbohydrates with different properties. You can link glucose units together to get a glucose polymer. In fact, when the body stores units of glucose linked together in the liver and muscle, it is called "glycogen," a term with which most people are familiar.

You can also link different kinds of sugars to get different products. For instance, if you combine glucose with fructose you get sucrose (table sugar). If you combine glucose with galactose you get lactose (milk sugar), and so on.

Link a bunch of sugars together and you get polysaccharides. Combine two sugars together like the previously mentioned lactose and you get a disaccharide. Of course, by themselves they are called monosaccharides. Are you starting to see a repeating theme here?

Link a simple unit together with other units and you get a product the body can do all sorts of things with. Linking units together gives you a product (fats, carbs, and proteins), and breaking down the products into units (ultimately) gives you energy.

You will notice I have not mentioned the "essential carbohydrates" because there is no such thing! Though the body runs best on an intake of some carbs in the diet, the body can make its own carbohydrates from protein and other non-carbohydrate substrates, as mentioned in the protein section.

Digestion reverses the process: the body breaks down complex carbohydrates into simple carbohydrates and ultimately blood sugar (glucose)

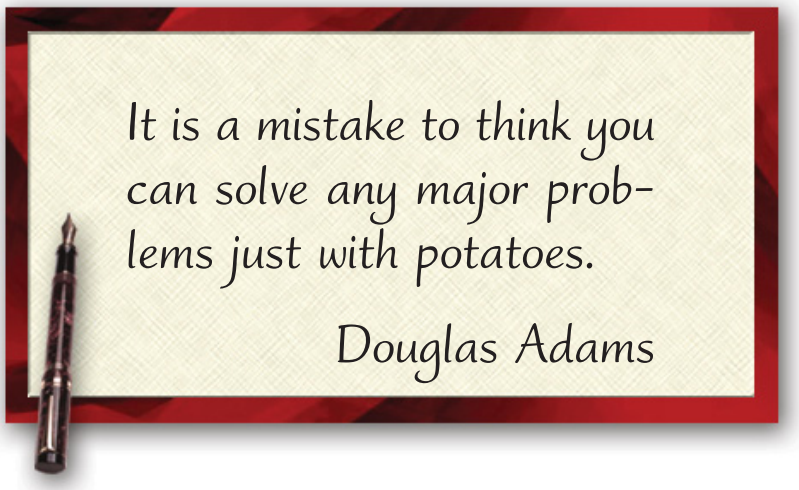
"You will notice I have not mentioned the "essential carbohydrates" because there is no such thing!"

which can then be used for many different functions, such as the production of ATP (the body's universal energy molecule). Depending on the carbohydrate and other factors, different carbohydrates will have different effects on blood sugar; in particular, how fast blood sugar rises and falls.

The ability of a carbohydrate food to raise blood sugar quickly or slowly is called the glycemic index (GI). The GI was developed to track how different foods affect blood sugar.

Interestingly, many carbohydrates that are considered "complex" have been found to raise blood sugar rapidly while a few "simple" carbohydrates don't have a dramatic effect on blood sugar. The GI rating of a food is based on how much blood glucose rises after consuming a carbohydrate food over a 2 hour period. This is compared to a reference, glucose, a simple sugar.

Some GI scales now use white bread as the reference, but we will use the glucose scale in this chapter. For instance, if you consume 50 grams of glucose (yuk), you will get dramatic elevation in blood sugar. If you eat, say 50 grams of carbs found in the form of oranges, your blood glucose would probably rise approximately 44 percent when compared to glucose. So, the GI rating for oranges would be 44 on the glucose scale. Using white bread as the reference carbohydrate, it would be a different number. Capiche?



Good Carb Sources & Sources to Avoid

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Good Carbohydrate Sources	Carbohydrates to Limit/Avoid
Oatmeal	White Rice
Yams/Sweet Potatoes	Pasta
Lentils	White Bread
Beans (pinto, black, etc.).	Instant Oatmeal
Brown Rice	Fruit juices
Vegetables: ALL Kinds	Processed Breakfast cereals
Fruit	Bagels
Other Whole Grains	Candy/Sweets
Whole Grain Breads/Pastas	Raisins
	Cream of Wheat

Notice anything about the foods on the left side of the table vs. the foods on the right? Two things: a) the foods on the left are either unprocessed or minimally processed; b) the foods on the left are high in fiber.

Fiber is also a carbohydrate, and an important component of the diet. High fiber diets have a wide variety of positive health effects. If a carb source is high in fiber, it will generally have a lower glycemic index than related low-fiber foods.

The glycemic index of a carbohydrate source is an important factor in deciding whether you should include it in your diet on a regular basis. The glycemic index is an indication of the insulin response you'll get when you eat it.

Why Is The Glycemic Index Important?

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The GI's importance relates to blood sugar's effects on the hormone insulin, the primary hormonal mediator of fat storage. Among its hundreds of different functions, the body uses the hormone insulin to control the amount of sugar (glucose) in the blood, help pull amino acids into the cells, turn on protein synthesis in lean tissues and regulate body fat storage.

Problems with the body's ability to regulate blood glucose appear if insulin does not properly bind to its receptors on the membranes of the cells or if the cells do not readily accept blood sugar.

As already indicated, the general name for the failure of normal amounts of insulin to maintain blood sugar (i.e., glucose) within acceptable levels is insulin resistance. When insulin does not bring blood sugar down after meals, the body secretes higher amounts of insulin until serum glucose levels eventually fall.

Not surprisingly, diets and nutrients, which reduce the amount of insulin required by the body, also appear to reduce the tendency toward excessive weight gain, especially in insulin insensitive people.

Controlling the GI of meals allows a person to keep a steady and predictable blood sugar level, which can lead to possible improvements in body fat levels, energy levels, etc. For the diabetic (the original reason the GI was invented), it can mean the difference between life and death.

Since the hormone insulin is well known for its ability to store glucose in muscle, increase protein synthesis and possibly increase muscle mass, it has predictably gotten the attention of bodybuilders and other athletes. In fact, it is sometimes said that insulin is a primary anabolic hormone produced by the body.

Some researchers feel that insulin is almost as important to lean muscle tissue as the anabolic hormones testosterone and growth hormone (GH). Insulin has direct effects on IGF-1 binding proteins (IGFBPs) and directly mediates some of the effects of IGF-1.

Unfortunately, insulin certainly has its downside. Of course, most people

know that insulin metabolism out of control will make a person rather fat, since insulin is a primary hormonal mediator of fat storage.

Insulin resistance increases the number of calories stored as fat and increases the amount of fat produced by the liver from carbohydrates. It gets worse: it turns out that insulin plays a big role in whether we produce our own fat from carbohydrates. And if we are making even a little fat, we turn off our ability to burn fat because the body does not make new fat and burn already stored fat at the same time.

"And if we are making even a little fat, we turn off our ability to burn fat because the body does not make new fat and burn already stored fat at the same time."

Of course, the concept of "insulin management" for adding new muscle to the hard-training athlete's frame is all the rage with various bodybuilding magazines, supplement companies and nutritional guru types. If you can manage insulin via the GI correctly, you can add new muscle without adding a great deal of body fat. This is the goal of proper insulin management.

It's obvious that athletes and bodybuilders are far more aware than the general public of the importance of insulin, hence the popularity of insulin potentiating compounds such as chromium and vanadyl sulfate.

Some bodybuilders have chosen to go the Kamikaze route by injecting insulin directly, but it does not take a rocket scientist to realize how dangerous this practice is.

Can you say "coma?"

Also, many bodybuilders who play with insulin injections end up looking more like the Michelin Man than a bodybuilder.

One thing should be clear by now: proper insulin management is of paramount importance whether for athletes looking to add new muscle without adding body fat, as well as for non-athletes trying to avoid a host of medical ills.

Athletes want to improve their insulin/blood sugar metabolism because they know it can lead to increases in lean mass, glycogen storage in muscle, and decreases in body fat. The avoidance of future medical problems is certainly not a bad motivator, either.

What Are The Drawbacks Of The GI?

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What are the drawbacks of the GI? For one thing, many people hold it up as the Holy Grail of dieting, the be-all and end-all of nutrition. It's not. It is however another useful tool in the fight against body fat. Many things can alter the GI of foods.

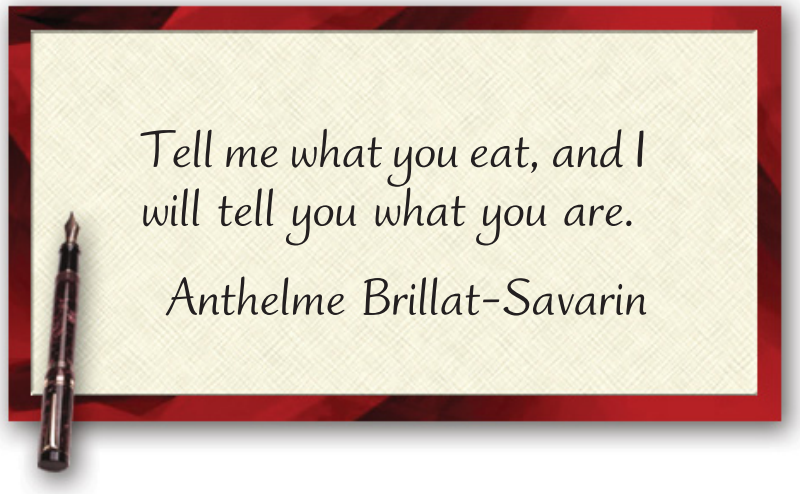
One drawback is that the GI is figured out in isolation - that is, each food is tested alone to figure out its GI number. This makes perfect sense from the research point of view, but rarely reflects how people really eat. Mixing different foods together - the way most people actually eat - can have dramatic effects on the GI of the food in question. Fat, fiber, protein, cooking times, etc. can all affect the GI of a food or a meal, for that matter.

Want to lower the GI of a rice cake, for example? Smear a tablespoon of peanut butter on it. The glycemic response to a meal can also be reduced by vinegar, such as in a oil-and-vinegar salad dressing. Prolonged cooking that increases starch gelatinization also increases the GI. Pasta cooked "al dente" has a much lower GI than the same pasta cooked for 15 - 20 minutes.

In addition, the GI of a food sometimes gives an incomplete picture of its impact on blood sugar. The GI value tells you how fast the carbohydrate in a food is broken down into glucose, but it doesn't tell you how much carbohydrate is present in a serving. This is why the concept of Glycemic Load (GL) was developed. The GL of a food accounts for the amount of carbohydrate present in a food. While the relationship between GI and GL holds for most foods, there are some exceptions. A few foods can have a high GI, but because they don't contain a lot of carbohydrate in a typical serving, the GL is reduced. Watermelon is a classic example, with a GI of 72 (GI > 70 is considered high), but a GL of only 4, which is quite low.

GI is also misleading in the case of the simple sugar, fructose. Fructose has a relatively low GI, but is quite lipogenic. Fructose consumption has been positively linked to the worldwide epidemic of obesity. Fructose is found in a wide variety of processed foods, and is also sold as an alternative "natural" sweetener - but it's something to be avoided in larger amounts if you want to limit fat gains, in spite of its low GI.

So, understanding the overall importance of the GI can be a useful tool in getting the most out of a diet plan for gaining muscle with minimum body fat, but it is far from the last word in nutrition. It's important as part of the "big picture," but shouldn't be the sole criterion used for including - or excluding - certain carb sources in your diet.



Effects of GI on Performance

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Researchers compared the effects of four different meals using different GI rated carbs. The diets contained 1 gram of carbohydrates per kg bodyweight fed 1 hour before cycling to exhaustion. For a 200 pound person, that would be 90 g of carbohydrates (200 divided by 2.2 = approx. 90).

The meals were made up of lentils (a low GI food), baked potato (a high GI food), glucose (the reference GI food) and water, which of course has no GI rating as it does not affect blood sugar.

One interesting find of the study was the lentil group burned more fat during exercise than the glucose or potato groups and lasted longer on the bike test than the other groups.

Several studies have found that eating low GI foods, prior to endurance exercise, results in more fat burned and improvements in performance. One study found women who consumed a moderate GI food 45 minutes before an exercise test, lasted 16 percent longer when fed low GI foods. Another study found that consuming low GI carbs before a cycling trial effectively increased the time to exhaustion, and decreased ratings of perceived exertion. It should be noted, however, that not all studies have found this effect of GI on performance.

On the flip side, beneficial effects have been observed when high GI sources are given in the immediate post-exercise period. High GI carbs - especially when combined with protein - facilitate glycogen storage and have positive effects on other aspects of post-workout recovery. This is a subject that will be covered in more detail in the discussion of pre- and post-workout nutrition.

Body Fat and GI

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As most people are probably aware, Americans are eating less fat, but are fatter than ever! One likely culprit is the fact that most people have replaced fat with high GI foods such as "low fat" cookies, cakes, rice cakes and other high GI foods.

Some research has even found the GI of food can actually alter the eating behavior all day long. A study in 1999, for example, examined how GI affected eating behavior in obese teenage boys.

The boys consumed either a high, medium or low GI meal at breakfast and lunch. The researchers then measured how much the boys ate for a 5 hour period after lunch. Each of the meals contained the same number of calories.

Amazingly, the study found food intake was 53 percent greater after the medium GI meal, and a whopping 81 percent greater after the high GI meal, when compared to the low GI meal.

As one would expect, insulin levels were dramatically higher after the high GI meal. The study showed that a single high GI meal could affect how many calories a person will eat many hours later. The reason for this is most likely the effect of the high GI meal on blood sugar.

As mentioned, the study found the insulin levels of the high GI meal were much higher than the other meals. When insulin rushes in to lower blood sugar after a high GI meal, the result is low blood sugar shortly after. The body senses the low blood sugar and responds by sending out the hunger signal.

Eating low to moderate GI carbs throughout the day keeps steadier blood sugar levels, so the body senses that adequate food and carbohydrates are coming in. The feedback pathways controlling hunger and appetite (no they are not the same thing) are incredibly complex and beyond the scope of this chapter. Suffice it to say, blood sugar level and its effect on insulin is a key feedback mechanism the body uses to sense incoming nutrients, and divert those nutrients where needed.

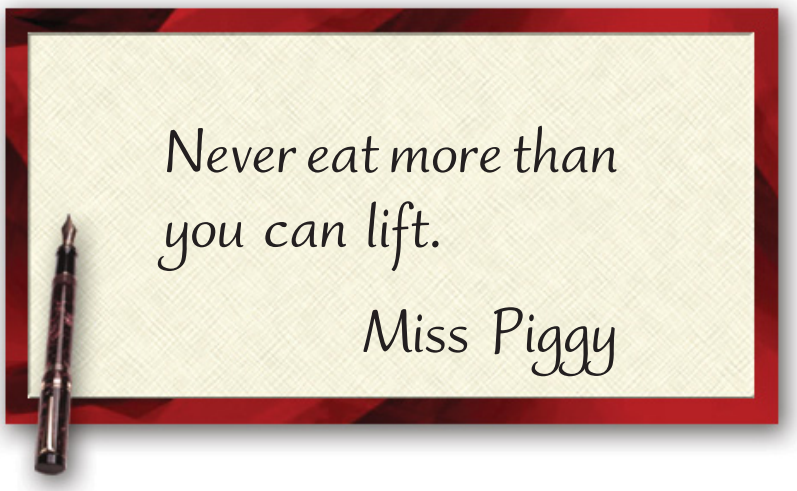
Numerous studies have found that the eating of high GI foods is associated with greater body fat levels. Some animal studies have found that feeding high GI foods to animals causes them to gain body fat. When you understand the role of insulin in human metabolism, it does not take a Ph.D. in biochemistry to see why this would happen.

One thing is clear, the GI of the carbs you eat will be a factor in how much body fat is ultimately produced from the meal and the spike in insulin you will produce.

You know those low fat cakes you were so happy about? Throw 'em out! One important caveat to remember is that calories also matter and although it may be possible to eat greater amounts of low GI carbs vs. high GI carbs without problems, it's far from a free-for-all excuse to stuff oneself with carbohydrates.

The body can only burn or store so much carbohydrate as glycogen. After that, increased body fat will be the result. The trick is to eat the correct amount – and types – of carbs to replenish glycogen levels and to fuel workouts and daily activities, while making up the other calories in healthy fats and proteins. How to do this will be covered in the following sections.

"One important caveat to remember is that calories also matter and although it may be possible to eat greater amounts of low GI carbs vs. high GI carbs without problems, it's far from a free-for-all excuse to stuff oneself with carbohydrates."



The GI and Health

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As expected, the GI has also been found to be directly involved with the risk of heart disease and other diseases, such as type 2 diabetes. Eating high glycemic foods can increase your risk of coronary heart disease. In fact, carbohydrates classified by their glycemic index, rather than as either simple or complex, were a better predictor of coronary heart disease in one study.

In another recent study, subjects on a low GI fat loss diet showed greater improvements in a range of health risk factors, such as blood pressure, insulin resistance, serum triglycerides, and C-reactive protein, than did subjects consuming a typical, higher carb/low fat diet. Other research has shown reductions in LDL ("bad") cholesterol as well.

Epidemiological evidence suggests that diets rich in high glycemic index/glycemic load carbohydrates are risk factors for a wide variety of other conditions. High GI diets increase the risk of macular degeneration, gallstone disease, and colorectal, breast, and prostate cancers.

Low GI foods also tend to be more nutrient-dense than high GI, processed foods, so there are positive effects to be gained from a low GI/GL diet, beyond simple effects on blood sugar and insulin levels.

There are no downsides associated with eating low-GI foods, beyond being deprived of junk food, that is!

A Summary Of The Effects Of GI

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To sum up the effects of low GI carbohydrates:

- Eating low GI foods prior to exercise may increase the amount of free fatty acids in the blood, therefore increasing fat burning (beta-oxidation for you propeller heads).
- Eating low GI foods may result in less food eaten later in the day via improved appetite suppression.
- Eating low GI foods may be healthier for you metabolically due to stable insulin levels and a possible decreased risk of heart disease.
- Eating low GI foods may, in the long run, promote lower body fat levels and a leaner, more muscular physique.
- Low GI means a smaller rise in blood sugar, which can help control established diabetes and may improve blood sugar metabolism of people with Syndrome X (most likely due to in an improvement in the body's sensitivity to insulin).

I've included a partial list of the GI values for some common foods on the next page. There is no hard science to what is considered a low or high GI food per se, but a good guide is: low is below 50, intermediate is between 50 and 70 and high GI foods are 70 and above on the scale.

GI Ratings For Common Foods

Pasta	GI Score
brown rice pasta	92
linguine, durum	50
macaroni	46
macaroni & cheese	64
spaghetti	40
spaghetti (protein-enriched)	28
vermicelli	35
vermicelli, rice	58

Fruits	GI Score
apple	38
apricot, canned	64
apricot, dried	30
apricot jam	55
banana	62
banana, unripe	30
cantaloupe	65
cherries	22
dates, dried	103
fruit cocktail	55
grapefruit	25
grapes	43
kiwi	52
mango	55
orange	43
papaya	58
peach	42
pear	36
pineapple	66
plum	24
raisins	64
strawberries	32
strawberry jam	51
watermelon	72

Legumes	GI Score
lentils	28
soybeans	18
baked beans (canned)	48
baby limas	32
chickpeas	33
kidney beans	27
navy beans	38
pinto beans	42
split peas	32
soybeans	18

Grains	GI Score
barley	22
brown rice	59
buckwheat	54
bulgar	47
cornmeal	68
couscous	65
millet	75
rice, instant	91
rice, parboiled	47
rye	34
sweet corn	55
white rice	88

Dairy Foods	GI Score
milk, full fat	27
milk, skim	32
ice cream, full fat	61
yogurt, low fat, fruit	33

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Breads	GI Score
white bread	70
whole wheat bread	69
pumpernickel	41
dark rye	76
sourdough	57
heavy mixed grain	30-45
Breakfast Cereals	**GI Score**
All Bran Soy' n Fibre	33
Raisin Bran	61
Froot Loops	69
Special K	69
Grape nuts	75
Corn Pops	80
Cornflakes	84
Rice Krispies	82
Cheerios	83
Puffed Wheat	80
All Bran	42
porridge	46
Snack Foods	**GI Score**
Mars Bar	65
jelly beans	80
chocolate bar	49

Please note, the most comprehensive list of foods rated by GI can be found online.

Click Here

To discuss the glycemic index further, you can post in the Members' Area.

Click Here

To discuss carbohydrates further, you can post in the Members' Area.

Click Here

Looking At The Big Picture: "The Brink Pyramid"

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Developing a solid nutrition plan involves more than just knowing which foods to eat; you also need to consider how much of each to consume, and how often. In other words, you need to know how to prioritize foods when you're constructing a nutrition plan. For example, both broccoli and brown rice make the "good carb" list, but there's a clear difference in their energy density. Broccoli is high in fiber and nutrients, but provides relatively few calories. If your goal is to add lean mass, you will not be able to fulfill your calorie requirements if the bulk of your carbs come from broccoli or other fibrous vegetables. Yet fibrous vegetables are important too! So we need to set up some basic, common sense guidelines.

One of the simplest approaches that dieticians and nutritionists have used for years is the food pyramid, which was developed by the US Dept. of Agriculture (USDA).

Most people are aware of the USDA Food Pyramid: you can't avoid seeing it in the media, in schools, and so on. The Food Pyramid has been a mainstay over the years because it's a good teaching tool. It's a simple visual representation of how we're supposed to rank different types of foods in our diets for - supposedly - optimal health. You can take it in with a glance and apply it to your own diet.

There's only one problem: the nutritional "information" it provides is less than optimal in many ways. From the USDA's point of view, potatoes are in the same group as green vegetables and people are told to eat 6 - 8 servings per day of grains. It's a pyramid where all fats are created equal, seemingly all bad, and beans are within both the protein and vegetable groups.

In short, it's a well intentioned pyramid that has led to a great deal of confusion - especially the newest version, which can be seen at mypyramid.gov. While the new version is an improvement over the old one in some ways, it's far too abstract to influence people's food choices.

In other words, the Food Pyramid is a great idea, but flawed in execution. But that's easy to fix!

I would like to briefly suggest a food pyramid for bodybuilders and other athletes.

My pyramid, 'The Brink Pyramid' (see image at the end of this section) employs a more in-depth rating system over that of the standard pyramid. The USDA's pyramid assumes that:

- ***All fats are created equal.*** It makes the incredible blunder of lumping all fats in the same section (i.e., saturated, trans fats, monounsaturated, etc.)

- ***High carbohydrate diets are healthy.*** In truth, the standard pyramid invites an increase in body fat and other potential problems from the overly high carbohydrate intakes, most of which would be based on heavily processed carbs of the average American diet.

- ***Plant and animal protein sources are equivalent.*** The USDA pyramid puts beans, nuts and seeds in with the meats and eggs section. These are certainly healthy foods, but are only high in protein when compared to other plant foods. In addition, plant proteins are typically limited in one or more essential amino acids. How beans, nuts and seeds ended up with the meats and eggs section is a mystery to me.

- ***Supplements aren't part of a healthy diet.*** The standard pyramid ignores nutritional supplements altogether. In my view, that's an oversight and a mistake. No matter what a person's diet is like, supplements can and should play a role in optimal health and performance and therefore should be included. That's why I have given them their own position in what I consider a pyramid designed with optimal health and performance in mind.

- ***No one drinks alcoholic beverages.*** The standard USDA pyramid ignores alcohol, which is ubiquitous in our society. Although not a "food" per se in the classic sense, I think a proper pyramid should be set up to help people lead a healthy life regarding whatever they put in their mouths on a regular basis. A proper pyramid should be a quick, "at a glance" reference that people can use as a guide to healthy eating. Modest alcohol use has even been shown to be beneficial to health, a point that should be acknowledged by the powers-that-be who are giving us advice.

In short, a pyramid that ignores booze, supplements and differences in carbs, proteins and fats, is an incomplete pyramid in my view, and only leads to fatter, less healthy and nutritionally confused people.

Another important point to understand regarding the standard USDA pyramid is that the rankings and groups in that pyramid were not made exclusively on science, but also on politics. It's well known that the positioning of many key foods was altered after those industries lobbied heavily to have them moved to a more favorable location on the pyramid. My pyramid is an attempt to rectify that situation.

Based on what you have read from the above and looking at the visual representation of the pyramid, my "new and improved" pyramid should be pretty self-explanatory.

Take a look at "The Brink Pyramid." As in earlier pyramids, the pyramid should be read from bottom to top. At the base you find:

- Lean, unprocessed (or minimally processed) proteins from poultry, lean meat, fish (and other seafood), cottage cheese, eggs/egg whites, etc.
- Healthy fats and EFAs from cold-pressed, unrefined oils and foods such as nuts, nut butters/spreads, seeds and avocados.
- High fiber, low glycemic index carbohydrates from whole grains, 100% whole grain products, beans, sweet potatoes, etc.

For gaining quality weight, the majority of the calories you eat each day should come from the foods at the bottom of the pyramid.

The second row from the bottom contains groups that also play vital roles in your diet, but don't generally contribute a large number of calories:

- Fresh, fibrous vegetables and (some) fruits (needs no explanation).
- Supplements such as multivitamins/minerals, antioxidants and performance enhancers (e.g. whey protein, creatine, glutamine, etc.).

The third and fourth rows represent groups that are a part of living in "the real world." Needless to state, you should reduce/limit - and in some cases avoid - consumption of these foods:

"In short, a pyramid that ignores booze, supplements and differences in carbs, proteins and fats, is an incomplete pyramid in my view and only leads to fatter, less healthy and nutritionally confused people."

- Saturated fats from high fat cuts of red meat, pork, butter, cheese, sausages, whole milk, cream/sour cream and regular ground beef.

- Higher GI and/or low fiber foods such as white flour pastas, white rice, white potatoes, breads, bagels, processed breakfast cereals, instant oatmeal, certain fruits, etc.

- Alcohol: red wine appears to be the healthiest choice. Limit intake to two drinks per day for men and one for women.

- Sweets/high GI carbs from cookies/cakes, soft drinks, candy, juices, etc. (note: there is a specific application for high GI carbs post workout, but should be limited in a normal diet).

- Unhealthy, "bad" fats from processed cooking oils, trans fats, fried foods, rancid fats, etc. These unhealthy fats can be found in fried foods such as potato chips, French fries, and foods containing the words "partially hydrogenated" on the labels. Most margarines, though sold as healthy alternatives to butter, may, in fact, be even worse for our health due to their content of trans fats from the partially hydrogenated oils used to create a semi-solid texture.

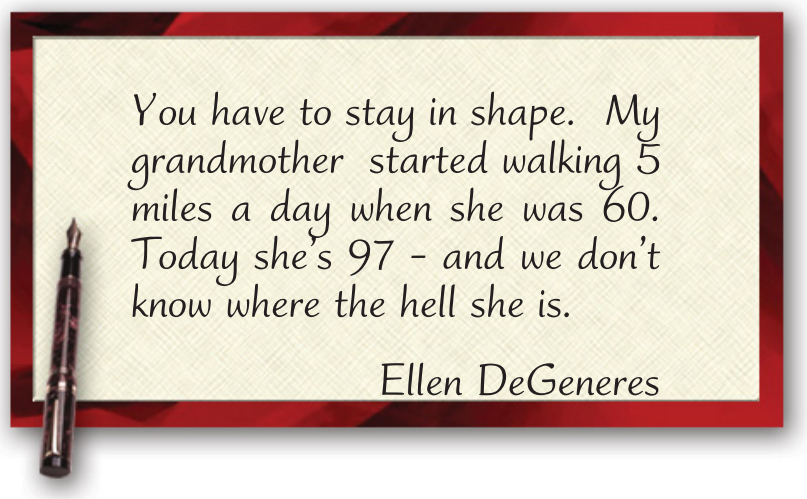
Using my pyramid, a person should have a much easier time developing a healthy eating pattern based on a more in-depth assessment of the foods and other nutrients we all eat (or should be eating!). It's a more targeted and intelligent approach to making proper food choices.

Of course, the amount of each food group will depend on many factors such as activity levels, exercise choices, age, goals and other variables beyond the scope of this section.

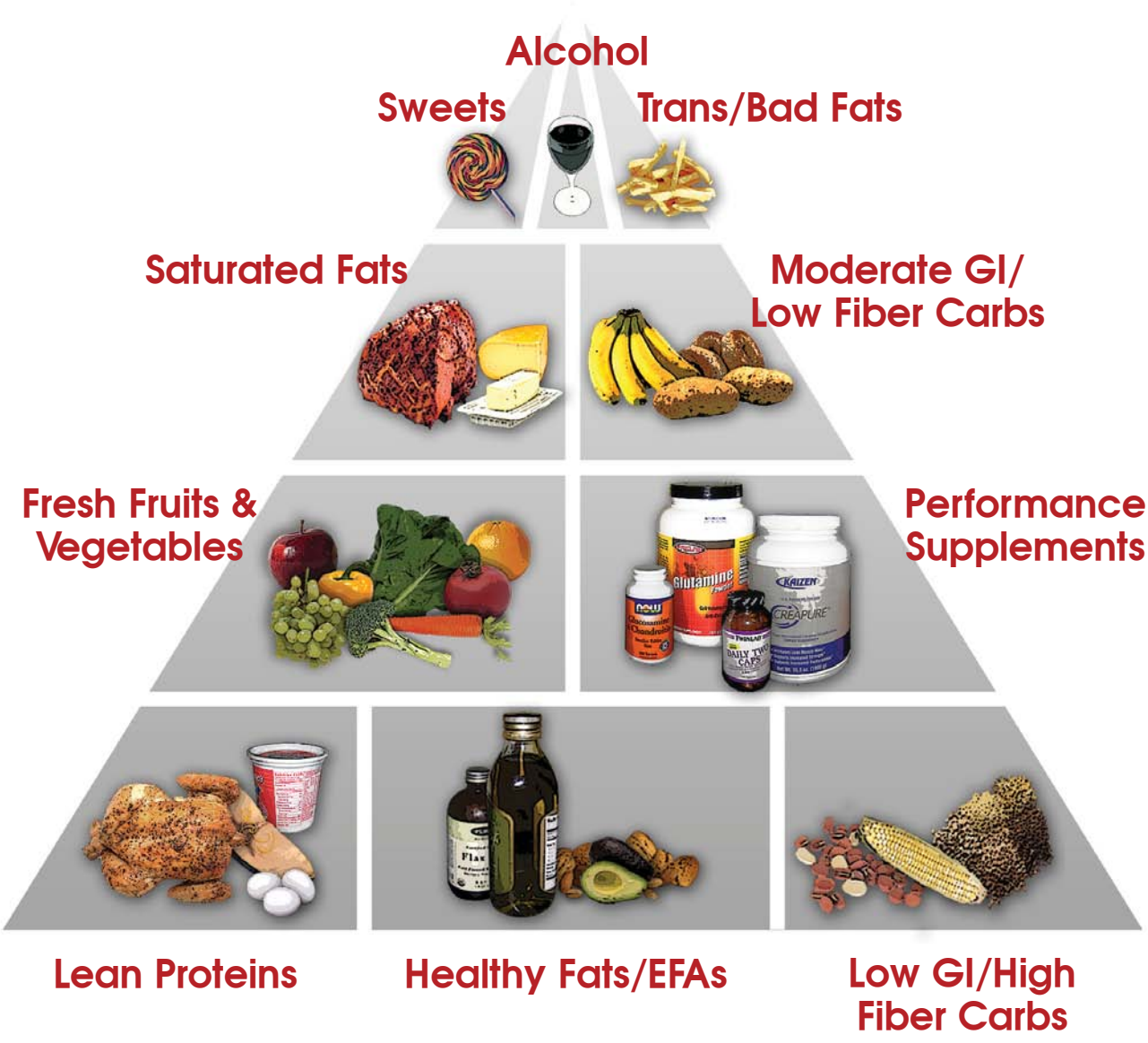
For example, a person who is a marathon runner could indeed eat a larger number servings per day of the starchy carbohydrates recommended in the USDA pyramid. But for someone who is more sedentary, it would be best to stick to the low end of the scale and consume a higher proportion of EFAs and protein. The same would be true for strength athletes, as well.

The bottom line is that the actual ratio of macronutrients (i.e. proteins, fats and carbs) and total calories necessary is relative, and depends on some of the variables mentioned above.

Which foods the person should rely on to achieve those goals, can easily be figured out from "The Athletes and Healthy Persons Pyramid", a.k.a. "The Brink Pyramid For Optimal Health and Performance", if you will.



The Brink Pyramid For Optimal Health and Performance



Brink's "Top 10" Bodybuilding Foods

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While my food pyramid provides a solid framework for selecting the best foods for building LBM, I'm often asked to provide more information. Specifically, people want to know what my "Top Ten" foods are - and why I think they're important.

It's a tough question, as there's a vast array of foods to choose from, and variety is important for a healthy diet too! Just because some foods are "better" than others in certain ways, doesn't mean that you should restrict your diet to those foods alone, in the mistaken belief that you've got all the bases covered. No one food - or short list of foods - can do it all.

Nonetheless, there are some foods that are especially useful, and pack some extra "bang" for your calorie "buck". So keeping the above considerations in mind, here's my "Top 10" list of foods that should make regular appearances on your menu. These are:

1. Lean Beef
2. Skinless Chicken/Turkey Breasts
3. Cottage Cheese
4. Eggs
5. Whey Protein
6. Tuna and Other Fish
7. Oatmeal
8. Whole Grains
9. Fruits and Vegetables
10. Healthy Fats

"Just because some foods are 'better' than others in certain ways doesn't mean that you should restrict your diet to those foods alone, in the mistaken belief that you've got all the bases covered. No one food - or short list of foods - can do it all."

What's so special about these foods? Here's the scoop:

- ***Lean Beef:*** Beef is often overlooked due to the perception that it's too high in fat. While this is true for many cuts, there are several that have

little more fat than other popular low fat choices, such as skinless chicken or turkey. For example, if you check out the nutritional information in the Food Database in the Members' Area, you'll discover that 100 grams (3 1/2 oz.) of broiled Top Sirloin steak provides a solid 30 grams of high quality protein, yet contains under 6 grams of fat.

Beyond the macronutrient content, beef is loaded with all sorts of things that are conducive to muscle growth. Beef is a source of highly bioavailable heme iron, creatine, carnitine, carnosine, CLA, B-vitamins, zinc and selenium. It should be a staple of any anabolic diet.

See the shopping lists in Chapter 3 and Appendix A for more cuts of beef that offer outstanding nutrition without excessive fat.

- ***Skinless Turkey and Chicken Breasts:*** Versatility and ease of preparation make these low fat meats the first choice for many bodybuilders. It's easy to find boneless and skinless poultry, already cut into single serving sizes which can be seasoned and quickly cooked in a variety of ways. Both are excellent sources of high quality protein and provide significant amounts of niacin, vitamin B_6 and selenium.

- ***Cottage Cheese:*** This is one of the most underrated bodybuilding foods. It's made by acidification of milk at a pH 4.6, which causes precipitation of the casein proteins. After that, the whey is drained off and the curd is washed repeatedly. The washings function to remove lactose and prevent further acidification of the curd, leaving relatively pure casein protein. It's also a an excellent source of vitamin B_{12} and a good source of calcium, phosphorous, zinc, folate, riboflavin and vitamin B_6. Cottage cheese can be found in nonfat and low fat (1% milkfat) versions, which are preferable to the higher fat (4%) products.

- ***Eggs/Egg Whites:*** Eggs are considered one of nature's most perfect foods, and they've been used as the standard for evaluating the protein quality from other food sources. Although eggs have gotten a bad rap for their cholesterol content, data has shown that dietary cholesterol has less impact on serum cholesterol than was previously supposed. Most people who eat eggs on a regular basis find they don't increase their cholesterol levels.

  Omega-3 fortified eggs are now available from flaxseed-fed chickens, which provide an additional benefit.

- ***Whey Protein:*** Whey protein is fully covered in the supplement section in Chapter 5, so only a summary is needed here. Whey is a product of milk. The two major proteins found in cow's milk are whey and casein. The whey proteins are separated and purified into whey concentrates and isolates. Whey has an exceptionally high biological value, high levels of BCAAs, and low levels of lactose and fat. Whey protein also increases the body's supply of glutathione, which improves immunity and helps protect against cancer. Glutathione's antioxidant activity may help protect athletes against overtraining syndrome, and provide other positive health and performance benefits.

  For even more details, see my articles on whey in the Brinkzone.

  To read "The Whey It Is":

  Click Here

  To read "The Whey To Weight Loss":

  Click Here

- ***Tuna and other fish:*** They don't call tuna "chicken of the sea" for nothing. Pretty much what can be said for chicken can be said for tuna: it's high in protein and low in fat. It's an easy and versatile way to get add protein to the diet and there are almost as many ways to fix up tuna as there is chicken. Unlike chicken however, the fat in tuna comes from omega-3 fatty acids (the "fish oils" EPA and DHA). The benefits of these fats are well documented: they can reduce the risks of heart disease, reduce inflammatory conditions, improve cognitive function, and may improve fat loss, among other functions important to human metabolism. Although fish in general does not have as high a biological value rating as eggs or whey, it's still a complete protein and a worthy addition to an athlete's diet.

- ***Oats/Oatmeal:*** Oats are a good source of both soluble and insoluble fiber, B vitamins (especially thiamin), minerals (e.g., manganese; magnesium) and low GI carbs. Oats are one of the few foods that the FDA allows specific health claims to be made for: the soluble beta-glucan fiber in oats has been proven to help reduce serum cholesterol.

  Not all oatmeals are created equal, however. For example, instant oatmeal has a higher GI than non-instant, "old fashioned" types. I recom-

mend that people eat the less processed forms of oatmeal, such as steel-cut/Irish oatmeal, which really sticks to your ribs and supplies a steady blood sugar for hours.

- ***Whole Grains:*** Some other good carb choices are whole grains/whole grain products, such as brown rice and 100% whole wheat breads/pastas. Much of what can be said for oatmeal above can be said for this category. Whole grain foods supply far more fiber, vitamins, and minerals than their more processed counterparts.

- ***Fruits and Vegetables:*** This is often an area of confusion for people. No one can, or should, live on chicken and brown rice alone. Fruits and fibrous vegetables are relatively low in calories, but offer vitamins, minerals, various antioxidants, various phytonutrients, and literally hundreds of other compounds that can prevent cancers, improve immunity, reduce cholesterol, and benefit athletes and regular people alike. A good rule of thumb is that the more deeply colored fruits and vegetables are the highest in antioxidants and health-promoting compounds.

  Some of the best fibrous vegetable choices include dark green leafy veggies like spinach and kale; as well as other vegetables such as carrots, green beans, broccoli, cauliflower, peppers, and tomatoes.

  Starchy vegetables such as sweet potatoes and yams, lentils, and other legumes are also excellent, nutrient-dense carbohydrate sources.

  There is often some confusion regarding fruit, it's either listed as the evil of the dieter or the greatest thing one could eat. Both are wrong. It's an issue of goals and balance. It's true the fruit sugar fructose can have negative effects on body fat and health in general when consumed in large amounts, but 2 - 3 servings of fruit per day will not cause any problems. Some good choices include blueberries (as well as others such as strawberries, raspberries, etc.), citrus fruits (i.e., oranges, red grapefruit), cantaloupe, and tropical fruits (i.e., pineapple, papaya).

- ***Healthy Fats:*** Flax oil has been a particular interest of mine for years. Flaxseed is one of the few plant sources rich in the EFA alpha-linolenic acid. Flax oil is an excellent addition to any diet for improving body composition and health. Flaxseeds are beneficial too. In addition to their EFA content, the seeds are a good source of manganese, copper,

folate, vitamin B_6 and magnesium. Flaxseeds are also a source of dietary fiber and plant lignans. The lignans in flaxseed are converted by gut microflora into the mammalian lignans enterodiol and enterolactone, which may reduce the risk of developing hormone-dependent cancers, particularly breast cancer.

Flax oil should not be used for cooking and needs to be kept refrigerated, as it becomes rancid quickly. Flaxseeds, on the other hand, are far more stable. Ground seeds can be added to shakes, homemade protein bars or other baked goods. It would be difficult to get your entire recommended intake of linolenic acid from the seeds alone, however, as it takes at least 3 tablespoons of seeds to consume the equivalent of one tablespoon of oil.

Whole flaxseeds should be ground prior to use, as the intact seeds are quite indigestible.

When choosing other oils, look for unrefined, cold pressed versions. Olive oil should be "Extra Virgin" or "Virgin".

Although the focus of the BBR diet is mostly on macronutrients, one of the take home lessons from my "Top 10" list is that micronutrients are important too. Each of the items on the list were chosen, not just because they're good sources of high-quality protein, good fats, and low-GI carbs, but because they have other things to offer as well.

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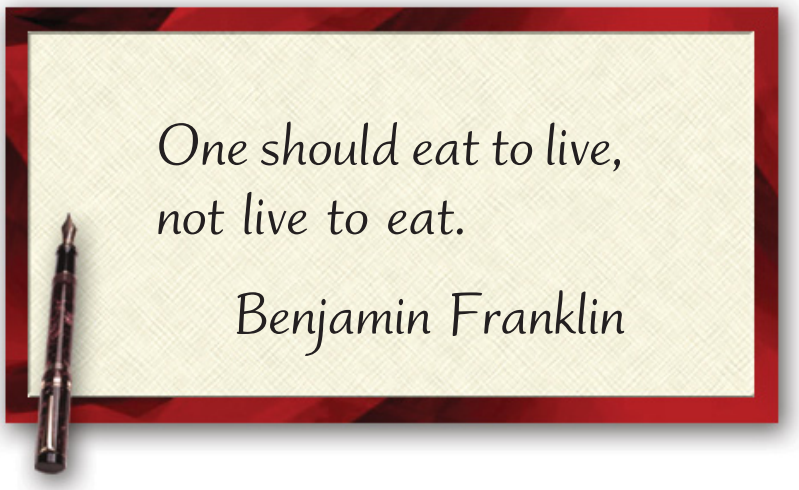


Vegetarians Vs. Meat Eaters

Return to T.O.C.

If there is one topic that gets people in the sports nutrition arena hot under the collar, is the age old "vegetarian versus meat eater" debate. In particular, the debate is focused on whether or not vegetarian diets are adequate and equivalent to diets that include meat when it comes to adding muscle mass.

Outlining the entire debate of both sides of the fence is beyond the scope of this discussion. I am going to stick to the debate regarding how a veggie diet vs. a meat-containing diet influences muscle mass, rather than the larger picture of whether or not vegetarian diets are inherently healthier than diets that contain meat and vice versa.

In a nutshell, strict vegetarians (vegans) maintain that meat is not essential for building muscle and a diet that mixes complimentary foods such as beans and rice is adequate.

Lacto-ovo vegetarians (vegetarians that include milk products and eggs) further maintain that the inclusion of milk and eggs, as highly bioavailable complete proteins, is more than adequate for athletes trying to build muscle and maintain peak performance.

Omnivores (omnivore meaning people who eat a wide variety of foods including meat) argue that meats such as chicken, beef and others are by nature more anabolic for a variety of reasons.

So who's right?

This debate has not been adequately looked at in the research but we do have some data that supports the omnivore's position. For example, several studies have found that meat-containing diets are superior for testosterone production than strict vegetarian diets.

As most people know, testosterone is an essential hormone for increasing and maintaining muscle mass while keeping body fat low. It's also essential for libido and mood in both sexes, but particularly important for men.

One study called, "Effects of an omnivorous diet compared with a lacto-ovo

vegetarian diet on resistance-training-induced changes in body composition and skeletal muscle in older men" looked directly at this debate.

The researchers wanted to find out if an omnivorous (meat-containing) diet was superior to a lacto-ovo vegetarian diet on the retention of muscle mass of older men put on a weight training routine.

Nineteen men aged 51 - 69 years old were enrolled in the study that ran 12 weeks. Nine men ate their normal meat containing (omnivorous) diet, providing 50 percent of total dietary protein from meat sources such as pork, chicken, fish and beef. Another 10 men followed a lacto-ovo type vegetarian diet for the duration of the study, with both groups following a weight training schedule.

Although the strength increases between groups were roughly the same, the study found that the whole-body changes in skeletal muscle size differed significantly between groups. Whole-body muscle mass increased in the omnivorous group, while it actually decreased in the lacto-ovo group. Apparently, the meat eaters gained muscle over the 12 weeks while the lacto-ovo eaters lost muscle mass. Ouch!

The authors concluded:

"...consumption of a meat-containing diet contributed to greater gains in fat-free mass and skeletal muscle mass with resistance training in older men than did an a lacto-ovo diet."

Is this a slam dunk against the vegetarian diet as it relates to the claim that it is just as good as a meat-containing diet for increasing muscle mass? No, but it does lend some support to the idea that omnivorous diets have an edge for producing optimal levels of anabolic (muscle building) hormones and increases in muscle mass. More research is clearly needed to confirm this, however.

There is still some debate over which of the two diets is healthier, however, and that has to be factored into peoples' choices as to which diet is best suited for them.

One area in which vegetarian diets are deficient vs. omnivorous diets is in muscle creatine stores. In the absence of supplementation, vegetarians have been found to have lower total muscle creatine - which could

"...consumption of a meat-containing diet contributed to greater gains in fat-free mass and skeletal muscle mass with resistance training in older men than did a lacto-ovo diet."

limit lean mass gains in response to training. The good news is that a recent study confirmed that vegetarians on a resistance training program responded well to creatine supplementation: their relative gains in work performance, total creatine/phosphocreatine levels, and lean tissue mass were even greater than the response for omnivores taking creatine, due to lower starting creatine levels. The researchers concluded:

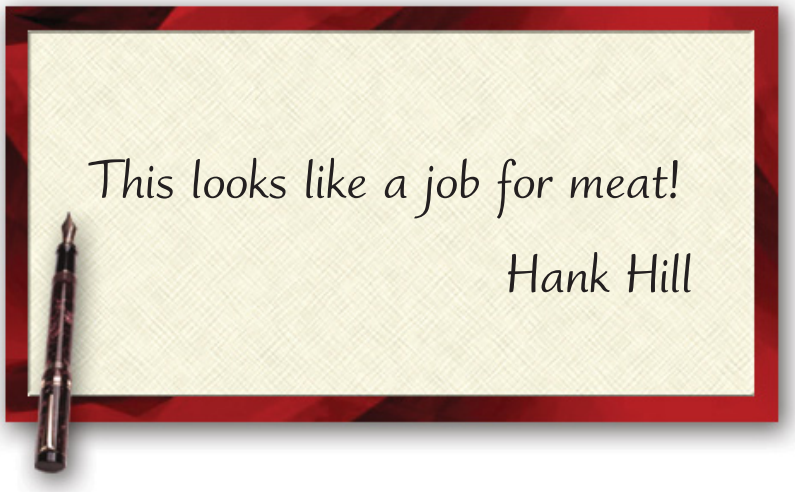
"...subjects with initially low levels of intramuscular Cr (vegetarians) are more responsive to supplementation."

> "...subjects with initially low levels of intramuscular Cr (vegetarians) are more responsive to supplementation."

Other areas of concern for vegetarians are: iron status (the iron in plant foods is less bioavailable than the iron in animal foods), zinc, vitamin B_{12} (cyanocobalamin), vitamin D (cholecalciferol) and calcium. The very high fiber intake associated with vegetarian diets may also, ironically, limit the number of calories a vegetarian athlete can consume. This is the basis for the Ornish Diet, which recommends a vegetarian or near-vegetarian diet for weight loss, on the grounds that eating high fiber plant foods automatically limits calorie intake.

The take-home lesson is that vegetarians wanting to increase lean body mass should make sure that important nutrients normally supplied by meat and other animal protein sources are included using a combination of appropriate foods and supplements.

It is not impossible to gain a significant amount of lean body mass on a vegetarian diet: legendary bodybuilder Bill Pearl is perhaps the best known example. Truth be known though, my bet would be in favor of the omnivorous diet if optimal muscle mass is the goal.



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Chapter 2: Constructing Your Muscle Building Diet

Making A Quick Start

Return to T.O.C.

This chapter is the heart of the nutrition and diet plan. It contains all the calculations that will be used to develop your diet plan. This chapter describes how to:

- determine the number of calories to start your gaining diet with;
- calculate the amounts of protein, fat, and carbs to eat each day;
- distribute calories and macronutrients over the number of meals you eat each day.

There's a lot of valuable and practical information in the following pages, but also a lot to take in. You may be more interested in getting a start on your diet, and returning to this chapter later as questions arise. The "Meal Planner" available in the Members' Area will help you do this. As detailed later in this chapter, the Meal Planner performs all of the necessary calculations for you: only some basic information is needed to work out your diet requirements.

If you'd like to jump ahead to the Meal Planner, click one of the two links below.

To jump to the explanation of how to use the Meal Planner:

Click Here

To go to the Meal Planner:

Click Here

Where Does The Food Go? Understanding TDEE

Return to T.O.C.

Before we set calories and figure out correct amounts for proteins, fats and carbs, it's important to understand where the calories go when we eat.

Understanding what happens to the calories in metabolism helps us make smart decisions about what we should be eating for a particular goal, such as losing or gaining weight.

There is a strong synergism between the foods we eat and our performance, muscle mass and body fat levels. People debate (make that fight!) about every aspect of nutrition: high carb vs. low carb diets, high protein diets, high fat diets vs. low fat diets, and so on.

Regardless of which diet a person follows, one element always remains a constant: the concept of energy balance. The energy balance equation can be summed up as:

Energy Intake = Energy Expenditure + Energy Storage.

It does not matter if your goal is to lose, maintain or gain body weight. Everything ultimately revolves around this simple equation. The type and ratios of macronutrients we eat matters as well as the total number of calories.

Brink's Universal Law of Nutrition states: "Total calories dictate how much you lose or gain, and macronutrient types and ratios dictate what you lose or gain."

To better understand energy balance, we must first be familiar with the components of energy expenditure. Total daily energy expenditure (TDEE, which is the average number of calories one oxidizes or "burns" in a day) can be partitioned into three components:

- Resting metabolic rate (RMR)
- Thermic effect of a meal (TEM)
- Energy expenditure of physical activity (EEPA)

"Brink's Universal Law of Nutrition states: 'Total calories dictate how much you lose or gain, and macronutrient types and ratios dictate what you lose or

Resting Metabolic Rate (RMR)

RMR makes a major contribution to TDEE and is associated with the energy cost of maintaining physiological homeostasis.

This includes the energy cost of maintaining body temperature, cardiac output, respiration, nervous system function and other involuntary activities.

This component of energy expenditure is influenced by body fat levels, gender, and physical fitness, but is determined primarily by lean body mass. Therefore, the greater the amount of lean body mass that you have at any given body weight, the greater your caloric expenditure - even at rest.

Your metabolism is the rate at which your body oxidizes (burns) calories to live. About 10 percent of your total daily energy expenditure is used to convert the food you eat into fuel or blubber (fat). Another 20 percent or so is accounted for by exercise and the everyday physical activities of life. I don't believe these figures are written in stone, but you can get an idea of where the calories you eat are going, at least.

However, the biggest block of energy is consumed by your resting metabolic rate (RMR), which accounts for up to 75 percent of your daily expenditure.

With the RMR accounting for this big a chunk of your daily calories, it behooves you to focus on the RMR as a key spot to manipulate. For example, people who are naturally blessed with a higher RMR will burn up to 200 calories more each day, even when they perform identical activities.

Can the RMR be altered? Of course! Your RMR is ultimately controlled by your genetic makeup; but age, gender and body composition also play an important role. Altering your body composition by increasing your muscle mass and decreasing body fat will increase RMR.

The reader may be thinking, "how do I increase my RMR?" Fortunately, when it comes to altering your RMR, nothing beats weight training.

Resistance training is essential for losing fat and maintaining lean body mass (muscle). In fact, it's just as important as aerobics, if not more so. The truth is, if a person has limited time, I would recommend weight training

"As you can plainly see, resistance training is essential to lose fat and to maintain lean body mass. In fact, it's just as important as aerobics, if not more so. The truth is if a person has limited time, I would recommend weight training over aerobics any day."

over aerobics any day. Several recent studies have confirmed that resistance training maintains resting metabolic rate (RMR) better than aerobics. Studies have shown, as well, that resistance training is far superior to aerobics for maintaining the metabolically active tissue we need (muscle!) for a superior fat burning metabolism, while trying to gain muscle mass.

Weight lifting is the best exercise you can do to keep your metabolism elevated over long periods of time. Resistance training burns approximately the same number of calories as running or hopping around in an aerobics class, but - unlike aerobics - the calorie burning and metabolism raising effects of weight training continue long after the activity has ended.

Aerobic exercise can never offer that benefit. After aerobic exercise, RMR returns to normal within an hour or so, resulting in the consumption of a few additional calories. Big deal. After weight lifting, RMR remains elevated for up to 15 hours! The bottom line: weight training increases post-exercise metabolism and builds muscle that is far more metabolically active than fat.

OK, back to the energy equation and understanding TDEE.

Thermic Effect of a Meal (TEM)

TEM is the energy increase that takes place after you eat a meal containing protein, carbohydrate, fat and alcohol.

The increase in energy expenditure is due to the cost of digestion, absorption, mobilization and storage of these macronutrients. On average this component comprises approximately 10 percent of TDEE. Perhaps most importantly, the thermic response to ingested foods is driven primarily by the ratio of macronutrients.

In other words, the thermic effect of the meal can vary widely, depending on the ratio of carbs, fats and proteins in a given meal. While both protein and carbohydrate will elicit notable and significant thermic responses, fat does not. This is one of several reasons why higher fat diets have been blamed for increased body fat levels over the years.

However, as mentioned throughout this chapter, the effects that fats have on body fat are complicated, since certain fats are helpful for reducing body fat, blocking fat storage, and for increasing beta-oxidation, etc. Though

"After aerobic exercise, RMR returns to normal within an hour or so, resulting in the consumption of a few additional calories. Big deal. After weight lifting, RMR remains elevated for up to 15 hours! Bottom line, weight training builds muscle that is far more metabolically active than fat."

the effect of fat on TEM is important to know, it's even more important - in my view - to remember that not all fats are created equal in terms of their effects on metabolism.

To conclude TEM, it can be stated that TEM varies according to the mixture or ratio of macronutrients eaten at a given meal and can be manipulated – to either increase or decrease TDEE – by altering the composition of the diet.

Energy Expenditure of Physical Activity (EEPA)

EEPA is the most variable component of TDEE. Translated, it's up to us to be either couch potatoes or gym rats! EEPA is composed of both involuntary (i.e., shivering) and voluntary muscular activity, such as exercise.

EEPA is influenced somewhat by body weight and composition. This means a heavier person will require more energy than a lighter person and a leaner person will require more energy than a fatter counterpart of the same weight for the same activity and intensity.

However, EEPA is primarily driven by an individual's desire and ultimate performance of activity, which is how hard they bust their butt on a particular activity.

Putting the TDEE Together

Finally, we can now equate a person's caloric needs as:

TDEE = RMR + TEM + EEPA

The TDEE can help us - not just to understand what our metabolisms do with the foods we eat - but to fine-tune our diets to achieve our goal of either gaining weight or losing it. If your TDEE exceeds calorie intake, you lose weight. If your calorie intake exceeds TDEE (i.e. you are eating more calories than you are "burning") you will gain weight.

The real question is: what will that gained weight be? Fat? Muscle? Ultimately what you gain or lose will be dependent on the ratio of macronutrients, exercise choices, and genetics.

"The TDEE can help us not just understand what our metabolisms do with the foods we eat, but help us fine-tune our diets to achieve our goal of either gaining weight or losing it."

The Harris-Benedict Formula

Return to T.O.C.

There are several methods for calculating calories specific to the needs and desires of the individual - in this case, men and women who want to pack on quality weight (i.e. muscle) as a result of their hard work in the gym.

Some formulas are a tad on the complicated side while others are quite simple. Although the following section will be overly complicated for some, don't despair. A far easier method for calculating calories follows, and the entire e-book uses it for the calculations on diet and calories. Ultimately, we will depend on the simple calorie calculations as our guide in this section.

It should be noted, however, that the more complicated formulas tend to be the more precise. An example of one of the more complicated formulas for figuring out calorie intakes based on the person's gender, activity levels, etc. is below. First, you need to calculate your RMR., then add TEM and EPEE, to get TEE. Finally, you have to add additional calories if weight gain is the goal.

Probably the most commonly used formula for calculating RMR., is known as the Harris-Benedict formula. It differs for male/female. However, an easier variant of Harris-Benedict Formula goes like so:

Formula to calculate RMR for men:

RMR = 66 + (13.7 x weight in kg) + (5 x height in cm) - (6.8 x age in years)

Formula to calculate RMR for women:

RMR = 655 + (9.6 X weight in kg) + (1.8 X height in cm) - (4.7 X age in years)

To calculate your total calorie needs, multiply your RMR by the appropriate activity multiplier:

- ***If you are sedentary (little or no exercise, desk job):*** multiply your

RMR by **1.2**

- ***If you are lightly active (light exercise/sports 1-3 days/wk):*** multiply your RMR by **1.375**
- ***If you are moderately active (moderate exercise/sports 3-5 days/wk):*** multiply your RMR by **1.55**
- ***If you perform heavy exercise (hard exercise/sports 6-7 days/wk):*** multiply your RMR by **1.725**

Don't forget: add 10% to account for TEM!

Example Calculation:

Using the above formula and other needed information to figure out how many calories are needed for quality gains, I plugged in my own stats: 167.5cm tall, 41 years old, and the moderate Activity Multiplier of 1.55. Because the e-book uses the body weight of 200 lb. throughout as the example weight in the Simple Method and the rest of the e-book, I used that weight (though I weigh approximately 175 lb. give or take) in the formula. So:

Weight in kilograms: 200 lb. / 2.2 = 90.9 kg
Height = 167.5 cm
Age = 41
Activity Multiplier: 1.55

RMR = 66 + (13.7 x 90.9 kg) + (5 x 167.5 cm) - (6.8 x 41 years) = 66 + 1245.3 + 837.5 - 278.8 = 1870 kcal

1870 kcal x 1.55 = 2898.5 kcal - this can be rounded off to 2900 kcal

Now we add 10% (290 kcal) to account for TEM:

2900 + 290 = 3190 kcal

So - for the purposes of this example, my total calorie needs (TDEE) are 3190 kcal per day.

The above still only accounts for RMR, TEM, and to some degree, EEPA, but does not take into account the goal of actually gaining weight. We need to add additional calories for that.

My recommendation would be to add an additional 10% to the number you come up with if you choose to use the above formula. So, continuing my example, 3190 kcals plus an additional 10% = 3509 kcals per day for the above example to account for RMR, TEF, EEPA, plus an additional 10% to that figure to gain weight.

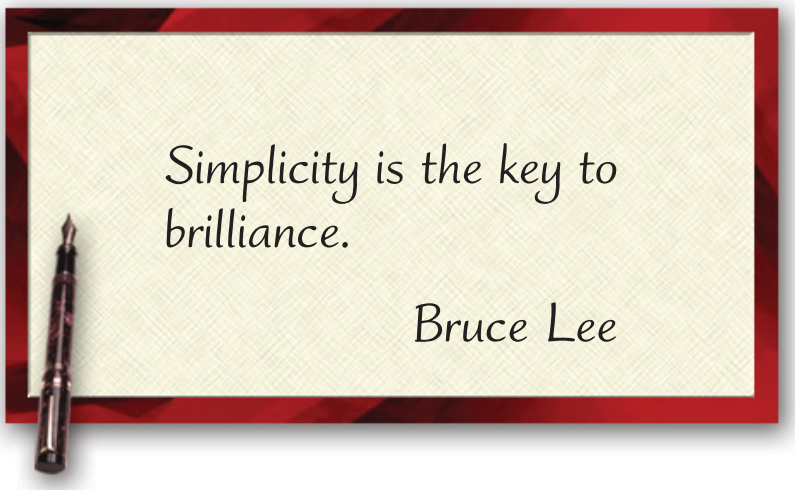
Remember, those numbers can be quite different person-to-person as such a formula has many potential variables to plug in. Thus, do not use my examples to decide on calorie intakes.

Also, one does not have to start out with an additional 10%. People who add fat easily or already have a higher amount of body fat may need to exercise more caution. One could start out with an additional 5% and see if weight gain takes place, increasing calories by 5% until weight gain does take place.

Hardgainers, on the other hand, could start with 20% above RMR, TEF, and EEPA, to get weight gain moving.

What do I recommend? I recommend you make life much easier on yourself and forget all about this formula and use the "Simple Method" outlined in the next section! The point of this section was to highlight the different factors that determine total daily energy needs. Some people like to make things as hard as they can, but for the rest of us, the K.I.S.S. principle works just as well.

"What do I recommend? I recommend you make life much easier on yourself and forget all about this formula and use the "Simple Method" outlined in the next section!"



The Simple Method For Calculating Calories

Return to T.O.C.

Ok, the reader is now thinking, "It can't be that complicated to figure out how many calories I need to gain quality weight!" The reader would be correct. I just wanted to show some of the methods commonly used to get exact figures for calories. A much simpler, albeit potentially less fine-tuned method for calculating calorie needs, goes like so:

Goal	Calories per kg	Calories per lbs
Weight Loss	20 - 25 kcal x kg	9 - 11 kcal x lbs
Weight Maintenance	25 - 30 kcal x kg	11 - 14 kcal x lbs
Slight Weight Gain	30 - 35 kcal x kg	14 - 16 kcal x lbs
Greater Weight Gain	35 - 40 kcal x kg	16 - 18 kcal x lbs
Weight Gain (Active People)	45 kcal x kg	20 kcal x lbs

So, let's return to our person who weighs 200 lb. (about 91 kg). We'll use the goal of "Greater Weight Gain" and a figure of 40 kcal/kg for a person - like me - who is active, but not really an athlete. If we crunch the numbers, we find that such a person will need 3,640 calories a day.

This is, needless to state, pretty close to the figure of 3,509 calories we worked so hard to come up with in the previous section. Another victory for the K.I.S.S. principle!

Now, those numbers are not written in stone. For example, the reader could start out using the 35 kcals per kg figure and see if that is enough calories to start gaining weight while lifting weights and doing other activities.

In my experience however, this might not be enough calories. Another method may be to start at the 35 kcals per kg figure and add 300 kcals per week until weight gain occurs.

You will have to make some judgement calls and decisions on your own regarding calories. For example, if you are naturally lean and have had trouble putting weight on in the past, you may want to start at the higher calorie intake of 45 kcals per kg.

On the other hand, if you are a person who carries more body fat than you

want, or have always had an easy time gaining weight in the form of body fat, you may want to start at the lower calorie intake of either 30 or 35 kcals per kg.

I strongly suggest you keep good records of your food and supplements, you can do this using the Diet Planner software in the Members' Area. Using the Diet Planner will be covered in detail in the next chapter, but suffice it to say, it's a valuable tool that can help you track your diet and make adjustments according to your results.

To check out the Diet Planner:

Click Here

While it's important to eat as "clean" as possible, past a certain point it's often difficult - especially for very active, younger people - to get enough calories from the recommended foods. It's virtually impossible to eat 4,000+ calories a day from boiled chicken and brown rice as many of the bodybuilders in the magazines claim to do (hint: I have been with many a pro bodybuilder who virtually lived at Taco Bell in the off-season!). Enlisting the help of protein powders, MRP's, and other calorie dense foods (e.g., think pizza and a few cheese burgers!) becomes necessary. A thin crust pizza with some added tuna, for example, when your exercising hard is no great sin. Additionally a burger on wholemeal bread, with a homemade 100% beef patty and salad, is equally in the cards when your trying to consume over 4000 calories per day (and for some, as much as 7000 calories or more per day). Anabolic nutrition requires anabolic foods, so nutrition is a priority when creating your diet plan. Feel free to improvise, however, to get the calories you need. Capische?

"It's virtually impossible to eat 4000+ calories a day from boiled chicken and brown rice as many of the bodybuilders in the magazines claim to do (hint: I have been with many a pro bodybuilder who virtually lived at Taco Bell in the off-season!)."

Now that we have the approximate calories figured out for making consistent gains in weight, we need to figure out the macronutrient breakdown.

That is, we have to figure out how much protein, fat, and carbs a person needs within the context of caloric intake, as figured above. The best way to go about that goal is: a) figure out protein requirements; followed by b) fat requirements; and finally c) carbohydrate requirements. Following this "a, b, c" format will make the process easier to understand and follow.

To discuss calorie requirements, post in the Members' Area:

Click Here

Macronutrients: Protein Requirements

Return to T.O.C.

As most people who lift weights are well aware, the "one gram of protein per pound of body weight" rule has been the mainstay advice for protein intakes for decades. But is it correct?

In the past, mainstream nutritionists and medical doctors have warned of dire consequences from such intakes of protein, which we now know is total bunk.

They also maintained for decades that athletes didn't need additional protein above the RDA.

For the past half-century or so, scientists - using crude methods and poor study design with sedentary people - have held firm to the belief that bodybuilders, strength athletes of various types, runners, and other highly active people did not require any more protein than Mr. Potato Head ...err, I mean the average couch potato.

However, in the past few decades, researchers using better study designs and methods with actual athletes, have come to a different conclusion altogether - a conclusion hard-training bodybuilders have known for years. The fact is that active people should consume far more protein than the RDA to maintain hard-earned muscle tissue when dieting, and to increase muscle tissue during the off-season.

As one of the top researchers in the field, Dr. Peter Lemon, stated:

"These data suggest that the RDA for those engaged in regular endurance exercise should be about 1.2 - 1.4 grams of protein/kilogram of body mass (150% - 175% of the current RDA) and 1.7 - 1.8 grams of protein/kilogram of body mass per day (212% - 225% of the current RDA) for strength exercisers."

Another group of researchers in the field of protein metabolism found that strength-training athletes eating 0.86 grams per kilogram of body weight (close to the RDA for protein) showed a decreased whole body protein synthesis (that's losing muscle, jack!). They came to an almost identical conclusion to that of Dr. Lemon in recommending at least 1.76 g per kilogram of bodyweight per day for strength-training athletes to stay in positive nitro-

"These data suggest that the RDA for those engaged in regular endurance exercise should be about 1.2 - 1.4 grams of protein/kilogram of body mass (150% - 175% of the current RDA) and 1.7 - 1.8 grams of protein/kilogram of body mass per day (212% - 225% of the current RDA) for strength exercisers."

gen balance/increases in whole body protein synthesis..

This same group found in later research that endurance athletes also need far more protein than the RDA/RNI and that men catabolize (break down) more protein than women during endurance exercise. They concluded:

"In summary, protein requirements for athletes performing strength training are greater than sedentary individuals and are above the current Canadian and US recommended daily protein intake requirements for young healthy males."

It should be noted that there is still some confusion on this point. In fact, some prominent researchers have suggested that protein metabolism actually becomes more efficient with training, and that there is no evidence of increased protein needs for either strength or endurance athletes. How do we resolve this conflict?

First of all, we need to acknowledge a critical fact: there is a difference between what's needed to maintain lean body mass, and what's optimal for increasing it. As a recent review on the subject acknowledged:

*"...for athletes desiring muscle hypertrophy, there is little reason to limit protein intake and relatively high intakes might be the best recommendation...Even if 2.5 - 3.0 g protein * kg^{-1} BW *day^{-1} is consumed and this amount of protein is more than the synthetic machinery can process, the excess will simply be oxidized. As long as the intake of other nutrients important to the success of an athlete is not compromised, there appears to be little harm in ingesting these high amounts."*

How does this information relate to the eating habits of the average athlete following the one gram per pound of body weight rule? Well let's see. Given that scientists work in kilograms we have to do some converting.

Recall that a kilogram weighs 2.2 lb. So, 200 divided by 2.2 gives us 90.9. Multiply that times 1.8 (the high end of Dr. Lemon's research) and you get 163.6 grams of protein per day.

Now this is an average figure, that doesn't take biochemical individuality into account. As with vitamins and other nutrients, you identify what looks to be the precise amount of the compound needed for the effect you want (in this case positive nitrogen balance, increased protein synthesis, etc).

"...for athletes desiring muscle hypertrophy, there is little reason to limit protein intake and relatively high intakes might be the best recommendation...Even if 2.5 - 3.0 g protein*kg^{-1} BW* day^{-1} is consumed and this amount is more than the synthetic machinery can process, the excess will simply be oxidized. As long as the intake of other nutrients important to the success of an athlete is not compromised, there appears to be little harm in ingesting these high amounts."

Then add a margin of safety to account for the biochemical individuality of different people, remembering the fact that there are low grade protein sources the person might be eating and other variables. Since there's no evidence of harm, it's best to err on the high side of the range, rather than the low.

So the current recommendation by the majority of bodybuilders, writers, coaches and others, of one gram per pound of body weight, does a good job in taking into account the current research and adding a margin of safety. In my view, one thing is for sure: a little too much protein is far less detrimental to the athlete's goal of increasing muscle mass than too little protein.

The truth of the matter, of course, is that many strength training athletes exceed the one gram per pound of body weight rule and are often closer to 1.5 to 2 grams of protein per lb. of body weight.

There are no particular reasons why readers can't eat intakes higher than one gram per lb. of body weight, if they so desire, but we will stick to the one gram per lb. figure for this chapter. This makes it relatively simple to determine total protein intake. An example calculation is shown below.

Example:

It's simple to determine the protein intake for a 200 lb. person:

Total protein: 200 lb. x 1 g /lb. = 200 g
Total calories from protein: 200 g x 4 calories/g = 800 calories
Percentage of cals. from protein: 800 kcal/3640 kcal = 0.22 (22%)

If the person was eating 1.5 to 2 grams of protein per LB of BW as some do, that percentage figure would be higher. The same person eating 1.5 g of protein per pound of BW would be getting:

Total protein: 200 lb. x 1.5 g/lb. = 300 g
Total calories from protein: 300 g x 4 calories/g = 1200 calories
Percentage of cals. from protein: 1200 kcal/3640 kcal = 0.33 (33%)

On the flip side, there is some evidence that suggests an upper limit, beyond which additional protein is useless. There appears to be a dose-response relationship between ingestion of essential amino acids and muscle protein synthesis, but only to a point. Protein synthesis in response to the ingestion of 6 g of essential amino acids was nearly twice that of 6 g of mixture containing only 3 g of EAAs; but the response was similar after the ingestion of either 20 g or 40 g or EAA.

The bottom line is that high protein intakes are beneficial, but there's no reason to go overboard! There is no evidence that going over 2 g protein per lb. will be useful for most athletes wishing to build muscle.

Protein: Myths And Realities

Return to T.O.C.

One of the more pervasive ideas about bodybuilding diets is the notion that high protein intakes are a health risk. Dire warnings about higher than recommended protein intakes causing increased rates of bone loss and "stress" to the kidneys, have been shown to be false by extensive and accurate studies. Nonetheless, this misunderstanding persists.

In fact, recent research has shown potential health uses for higher protein intakes. Other studies continue to suggest that higher protein intakes during a diet may be superior to other diets for fat loss, though the use of high protein diets for weight loss is still debated in nutritional and medical circles.

One review study that examined the above issues, "Optimal Intakes of Protein in the Human Diet," came to some interesting conclusions on the issue of protein and its potential health uses and safety issues.

The study outlined an extensive body of recent data showing that high protein diets may, in fact, be beneficial for reducing blood pressure and stroke mortality. Though some early studies appeared to show that higher protein intakes caused an excretion of calcium, which would ultimately lead to bone loss, recent studies have debunked that assertion. On the matter of bone loss, the review paper concludes:

"For bone health, the established views of risk of high protein intakes are not supported by newly-emerging data, with benefits indicated in the elderly."

Interestingly, a large body of research is now showing that the elderly may in fact require higher intakes of protein than is currently being recommended.

Regarding the potential for protein to stress the kidneys, though research suggests that people with pre-existing kidney disease should avoid high protein diets, no data has ever shown kidney function to be compromised in healthy adults and the above review study confirms this finding. A recent study that examined the renal (kidney) function of athletes who follow a high protein diet– that is, protein intake well above the US RDA – found no negative effects on the kidney function of these athletes.

"For bone health, the established views of risk of high protein intakes are not supported by newly-emerging data, with benefits indicated in the elderly."

So what's the take-home from the above? It is arguable whether or not athletes require additional protein to maintain their lean muscle mass and/or increase it, though most modern research appears to confirm they indeed should eat additional protein.

The point is, regardless of whether or not athletes need additional protein, higher protein intakes do not appear to pose any health hazards to healthy active people. And higher protein intakes may in fact have health uses of their own as has been found in a plethora of emerging research.

Another myth concerns how much protein a person can digest at any one time. Nutritionists and doctors maintained for decades that, "people can only digest 30 grams at a time of protein and any additional protein is wasted."

Now, I wish I could examine the study or research they are basing this advice on so I could dispute it, but I can't.

Why, do you ask? Because in all my years of searching the medical data banks, talking to researchers and falling asleep in the medical library after hours of reading, I have been unable to find exactly where this advice comes from or what it's based on.

At one time, I went so far as to offer a reward to anyone who could show me a recent study that showed that 30 grams of protein was the upper limit anyone could digest, regardless of age, weight and activity levels.

Why is it 30 grams? Why not 28 or 35? Are we saying that the digestive and absorptive ability of a 285 pound, 23 year old football player is the same as a 50 year old, 115 pound woman?

But to be completely fair, let's assume for the moment that the 30 grams rule turns out to be true. As discussed earlier, some of the studies done by researchers over the last decade on the protein requirements of athletes recommend intakes that exceed the RDAs by as much as 225 percent! These range from approximately 1.2 grams of protein per kilogram of body weight for endurance athletes, and up to 1.8g of protein per kg for strength training athletes.

For a 200 pound bodybuilder – a strength training athlete – that would be approximately 164 grams of protein per day. Assuming that 30 grams of

protein is the most anyone can digest, absorb and utilize at a time, this person would need to split his intake into about 5 - 6 meals (164 divided by 30 = 5.47) - which is what most bodybuilders do anyway.

In other words, even if the "rule" was true, there would be no cause for concern that much protein would be wasted, since the intake per meal would still be under (or close to) the theoretical "limit."

Nonetheless, the assumption that a 200+ lb. healthy athlete is unable to exceed 30 grams of protein in one sitting is neither proven by medical science nor even logical in my view.

Now digestion is a very complex topic. Many people think you eat some protein, it mixes with some acid or something, gets broken down into amino acids, gets taken up into the body and everyone is happy.

I wish it were that simple. As with all foods, the breakdown of protein starts in the mouth with the simple chewing of food and the exposure to certain enzymes.

In the stomach, food mixes with enzymes and other factors such as lipase, pepsin, intrinsic factor, and of course HCl (stomach acid). It moves onto the small intestine and then the large intestine. The small intestine is considered the major anatomical site of food digestion and nutrient absorption and is made up of sections such as the duodenum, jejunum, and the ileum.

Pancreatic enzymes (chymotrypsin, trypsin, etc.), bile salts, gastrin, cholecystokinin, peptidases, as well as many others factors are released here. The large intestine is composed of the ascending colon, transverse colon, descending colon, and the sigmoid colon, which all play a part in absorbing the nutrients we eat.

Sound complicated? It is. Believe me, I am leaving out a great deal of information so you won't fall asleep!

Suffice it to say digestion is a very complicated thing and there are many places along the chain of digestion that can both enhance and degrade a person's ability to absorb the foods we eat. This is a complex process, so there are likely to be wide individual differences in the ability to digest and absorb protein. For the person who is inactive or lives with compromised

digestion (for whatever reason), 30 grams of protein at one sitting might very well be too much to handle.

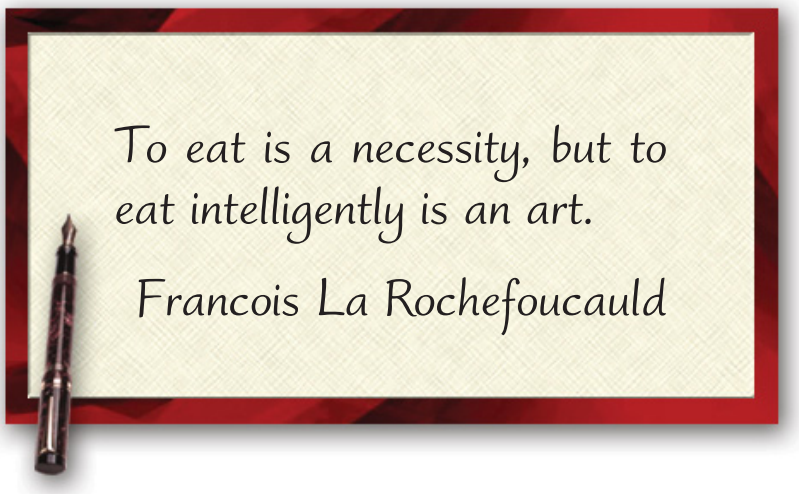
Even that's speculation, however. A 1999 study, "Protein pulse feeding improves protein retention in elderly women" fed 15 elderly women 80% of their total daily protein intake in a single meal (lunch). The result was improved nitrogen retention vs. the same total protein intake spread out over 4 meals. The researchers fed the women 1.7 g protein/kg of fat-free mass. If we assume the women in the study were small and frail, with a lean mass of only 40 kg (88 lb.), their intake works out to 68 g protein per day. In the experiment, they consumed 80% of that total in a single meal. That would be a bit over 54 g protein at one sitting. Now maybe 100% wasn't digested/absorbed, but most of it must have been - as their nitrogen status was better than when they consumed the protein in smaller increments throughout the day.

So if elderly women were able to digest and utilize more than 30 grams of protein in a single meal, why wouldn't a healthy, active man or woman be able to?

So if you happen to eat more than 30 g of protein per meal, I don't think you have anything to worry about. I won't tell anyone.

To discuss protein requirements further, you can post in the Members' Area.

Click Here



Macronutrients: Fat Requirements

Return to T.O.C.

Fat. The very word sends a shiver up the spine of the leanest athlete. Without a doubt, fat is the most misunderstood and maligned of nutrients.

Most people – including educated people who should know better – take a "fat is fat and should be avoided" approach to eating. Nothing could be further from the truth, especially when trying to put on quality mass.

Are all fats created equal and should we avoid fat, if trying to gain lean mass? The answer to both questions is a resounding no!

It's interesting to note that people have no problem accepting the fact that there are different types of carbohydrates with different effects on the body, as described above. The terms "simple" and "complex" or "high glycemic" and "low glycemic" get thrown around all the time when referring to carbohydrates.

The same holds true for proteins. Terms such as "complete" and "incomplete" proteins or "high biological value" as well as other terms are applied to proteins whenever we read an article on the topic.

People seem to have no problem understanding and accepting that there are large differences in the types and quality of carbohydrates and proteins they eat, but often think of all fats as being equal, without any unique effects of their own.

"Fat is fat", they will say. They are told to avoid all fats and to consider fat as the enemy of the athlete or the person trying to shed some weight. As briefly outlined previously, fats have just as many biochemical differences and effects on the body as carbohydrates and proteins do.

There are many different types of fats, such as monounsaturated, saturated, polyunsaturated, omega-3, omega-6, as well as many others. Within this group are even more lipids (fats) such as alpha-linolenic (ALA), linoleic (LA), EPA, DHA, GLA, CLA and so on. The idea that "a fat is a fat, and all fats are bad for you and should be avoided" is, of course, ridiculous advice and is based on outdated research and sheer ignorance of the topic.

"'Fat is fat', they will say. They are told to avoid all fats and to consider fat as the enemy of the athlete or the person trying to shed some weight."

There is no doubt that certain fats such as saturated and trans fatty acids should be limited or avoided if peak performance, long-term health and/or weight loss is the goal.

On the other hand, a great deal of recent research is showing that moderate fat intakes, of the right types of fat, do - in fact - have a place in the athlete's diet, as well as the average person concerned with long term health, weight loss and performance.

So, the trick is to learn to see fats as a group of lipids that have their own unique effects on the body. We can, then, shed the old notion that fat is the enemy of the athlete, because it's simply not true.

With that in mind, we will continue to outline the fat requirements for this chapter when an optimized anabolic environment for growth is the goal.

As most people are aware, hormones such as testosterone, growth hormone, insulin like growth factor-1 (IGF-1), and insulin are major anabolic (muscle building) hormones.

It's well known that a particular hormonal milieu is needed to increase muscle mass and decrease body fat in response to exercise. For example, a weight lifter with inadequate testosterone levels will find it virtually impossible to add muscle mass even though he is weight training and eats well. A good diet and training regimen is essential to increase strength, muscle mass, and performance. Yet, without adequate anabolic hormone levels, he is essentially spinning his wheels. This known fact has been responsible for some athletes turning to synthetic versions of anabolic hormones, such as anabolic steroids and man-made growth hormone, as well as other compounds. What are overlooked by many people, however, are the effects that macronutrients (carbohydrates, fats, and proteins) have on the production of anabolic hormones.

Testosterone is generally considered the king of anabolic hormones, especially in men. Anything that can positively and safely affect testosterone levels is considered a plus for athletes concerned with building muscle and increasing strength.

Although essential for increasing muscle mass, testosterone has many functions in the human body ranging from libido, to immunity, to depression. So an increase in testosterone levels can have many positive applications.

"Testosterone is generally considered the king of anabolic hormones, especially in men. Anything that can positively and safely affect testosterone levels is considered a plus for athletes concerned with building muscle and increasing strength."

This is particularly true for men and women (yes women need testosterone too!) who suffer from low levels of this essential hormone.

Although high carbohydrate, low fat diets have been all the rage for the past decade or so, they may be particularly hard on testosterone levels. For example, one study examined 30 healthy male volunteers who were switched from their customary diet that supplied 40 percent of energy as fat, to a diet containing significantly less fat (25 percent of energy) for 6 weeks.

The study found a statistically significant drop in serum testosterone levels (from 22.7 nmol/l to 19.3 nmol/l), free testosterone and other androgens. This study also found that a higher ratio of saturated fat to polyunsaturated fat was positively correlated with higher testosterone levels.

Another study that had two groups eating approximately the same ratios and amounts of carbohydrates and fats, found a "mixed" diet that included animal products resulted in higher testosterone levels than a lacto-ovo vegetarian diet. Several other studies appear to confirm the effects of dietary fats on testosterone levels, as well as other dietary variables.

However, there is a ceiling of how much fat should be eaten to achieve optimal testosterone levels. Studies suggest that 30 percent of calories from fat appears to be the proper amount of fat needed, as diets higher than 30 - 40 percent showed no extra advantage. The lesson here is, for optimal hormonal production of anabolic hormones in athletes, adequate fat is essential.

Knowing that information, we will set up the fat requirement of our anabolic diet with fat comprising 30 percent of total calories.

Example:

To determine total fat for a 200 lb. person, we need to start with the total calories. 30% of the total calories will be from fat. Since fat provides 9 calories per gram, dividing by 9 will give us the total grams of fat for the day:

Total calories from fat: 3640 kcal x 0.30 = 1092 calories
Total grams of fat = 1092 kcal/9 kcal per g = 121.3 g

The One-Third Rule

Now that we have the total amount of fat figured out, we need to decide on what type of fat, since different fats have different effects on health, testosterone levels, etc.

As research has made clear, some saturated fat is needed for optimal testosterone production. What I suggest to people is that they follow the one-third rule: one-third of your fat allotment should come from unprocessed polyunsaturated fats with high omega-3 contents (e.g. flax, hemp, *Udo's Choice*, fish oils, etc). Another third can come from monounsaturated fats (e.g. olive oil, avocados, etc.). The final third should come from saturated fats that are already found in red meat, whole milk, butter, etc.

This ratio allows for optimal testosterone production, quality weight gain, and performance, without sacrificing your health in the process. I have found this to be a highly successful strategy for quality muscle gains with minimal body fat increases (though body fat is still dependent on other factors such as total calories, activity levels, genetics, etc).

If you divide the total fat grams per day (121) by 3 you get slightly over 40 grams of fat. That's approximately 40 grams from high omega-3 EFA rich oils, 40 grams from monounsaturated fats, and 40 grams from saturated fats, all divided over the day's eating.

If you divide the total fat between 6 meals, you will find that each meal requires roughly 20 grams of fat per meal. A half-tablespoon of flax oil mixed in a protein drink (7 grams), another half-tablespoon of olive oil over a salad, and the naturally occurring saturated fat in, say, a 5 ounce piece of lean red meat, will cover our 200 lb. example.

You will notice that the above comes close, but does not follow a perfect one-third rule for fats, but different meals can have different ratios of fats as long as the total for each is met each day. Life is too short to sit around trying to get it perfect with each meal!

To discuss fat requirements further, you can post in the Members' Area.

Click Here

Macronutrients: Carbohydrate Requirements

Return to T.O.C.

Figuring out carbohydrate requirements is the easy part. It's what ever is left over after you have figured out protein and fat requirements.

Example:

To determine total carbohydrate for a 200 lb. person, we can use the figures previously calculated for protein and fat.

Percentage of calories from protein: 22%
Percentage of calories from fat: 30%
Percentage of calories from carbs = 100% - 22% - 30% = 48%

Total calories from carbs: 3640 kcal x 0.48 = 1747 calories
Total grams of carbs per day: 1747 kcal/4 kcal per g = 436.8 g

This is more than sufficient to fuel tough workouts and refill liver and muscle glycogen after exercise in a 200 lb., moderately lean person.

Choose carbohydrates from the moderate and low GI lists above and use high GI carbs for pre- and post-workout nutrition.

Simple no? Of course, the carb numbers would be different if the person was eating more protein (thus leaving less percentage of carbs from the total calories) or weighed less or more or was using the lower calorie values in the calorie chart.

To discuss carbohydrate requirements further, you can post in the Members' Area.

Click Here

Dividing Calories Into Correct Meals

Return to T.O.C.

Finally, we get to put all our hard work together into a final diet structure. The optimal way to keep steady blood sugar and a steady availability of nutrients to the body is to divide the calories into 5 - 7 meals per day.

Example:

In the previous sections, we determined that a 200 lb. person would need to eat 200 g protein, 437 g carbs, and 121 g fat per day. To work out how much to eat in each meal, we need to divide these figures by the number of meals: 5, 6, or 7.

Assuming our example is eating 6 meals a day, this looks like:

Protein: 200 g/6 = 33.3 g/meal

Carbs: 437 g/6 = 72.8 g/meal

Fat: 121 g/6 = 20.2 g/meal

Now, the above is a pretty classic and straightforward way to approach a weight gain oriented diet plan, but what of nutrient timing? Though the magazines and many self proclaimed "guru" types act as if there is some magic way of timing nutrients to be the next Dorian Yates, it's more pseudo science than scientific fact.

"Now, the above is a pretty classic and straightforward way to approach a weight gain oriented diet plan, but what of nutrient timing? Though the magazines and self-proclaimed "guru" types act as if there is some magic way of timing nutrients to be the next Dorian Yates, it's more pseudoscience than scientific fact."

Of course, it makes sense to eat immediately after waking up, since one has been fasting for the 7 - 9 hours of sleep. It also stands to reason, based on the data we have, that pre- and post-workout nutrition may further assist in optimizing gains in LBM. There are no magic nutrient timing formulas, however. Or, perhaps I should say: there are no magic formulas out there for timing nutrients that are anything more than the writer's fantasy.

The basic goal is to keep a steady flow of nutrients throughout the entire day by properly dividing up your meals as mentioned above, and sticking with it. There is also some logic to eating a small protein meal prior to bed,

using a slow digesting protein from the recommended food lists, such as casein or cottage cheese.

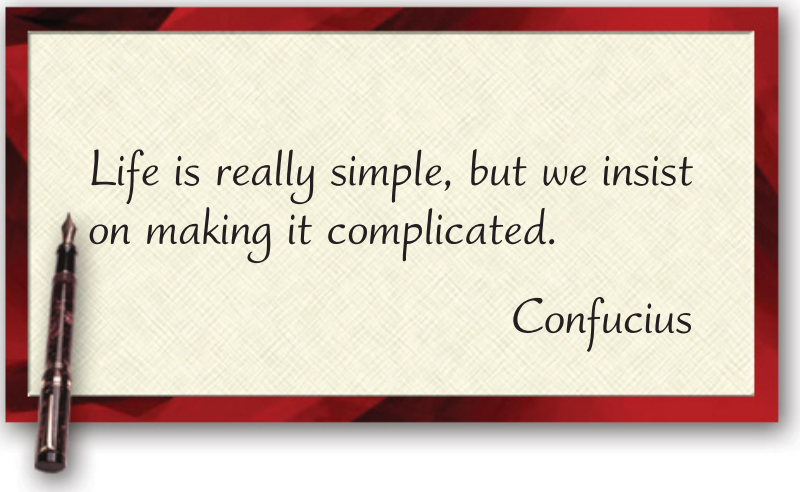
Although all of these strategies, e.g., pre- and post-workout nutrition, eating before sleep, etc., make intuitive sense, and there is some data to suggest they will help, there really is no solid proof as of yet, that they will make a difference beyond simply getting adequate calories of the right types, and in the right ratios, at regular intervals during the day, as this e-book has outlined.

Again, don't be fooled by magic "nutrient timing" formulas that the author discovered during his trip to a secret lab in the East, or while working for the CIA. The time tested rule for people who have made steady gains is to use a well-designed diet that is consistently applied month in and month out.

Of the dozen or so professional bodybuilders I have worked with or known, and the many high level amateur bodybuilders I have worked with, THAT was what accounted for their diet success, not running off to follow the latest greatest "secret" diet strategy advertised in the mags. In fact, they laugh at such people.

As in war, anabolic nutrition also follows the K.I.S.S rule for success: Keep It Simple Stupid…Yes, there are some general rules for timing your meals, such as eating first thing in the morning and approximately every 3 hours after that, using pre- and post-workout drinks, and a having few bites of cottage cheese before bed; but it's a pretty straightforward process, I assure you.

"As in war, anabolic nutrition also follows the K.I.S.S. rule for success: Keep It Simple Stupid...Yes, there are some general rules for timing your meals...but it's a pretty straightforward process I assure you."



Using The Meal Planner To Calculate Calories

Return to T.O.C.

Can figuring out your daily calories get any simpler than pulling out a calculator and multiplying your weight by the right number of kcals/lb.?

Believe it or not, it can.

I've had a "Meal Planner" created for the BBR Members' Area that performs all the calculations for you. The calculations performed by the Meal Planner are based on the numbers from the "Simple Method" table in the previous section. You don't even need a calculator now: the only thing you need to do is answer a few simple questions and the Planner takes care of the rest.

A pic of the user form appears on the next page (Figure 1). All I had to do was to type in my weight (or the weight I'm using for this example); click on the option that best describes my body type; choose the number of meals I normally eat; type in my age (shudder!); and finally, choose between "male" or "female".

Then, once all the "work" was done, I clicked the button on the bottom of the page. The whole process took approximately 15 seconds.

The Planner report appears in Figure 2. You'll note that the report uses a more precise figure for the total calories and other numbers. This is because it used a figure of 90.9 kg, rather than rounding up to 91 kg, like I did in my example. The difference is minimal - especially so when you consider that it's nearly impossible to eat the exact amount of calories needed each day...even on a good day, you'll always be a bit over or a bit under. And that's ok - a small amount of variation is expected, and isn't going to make or break your efforts.

Check out the Meal Planner:

Click Here

Figure 1: the user form for the Meal Planner. There are only 5 pieces of information that are needed for the Planner to create a meal and calorie plan.

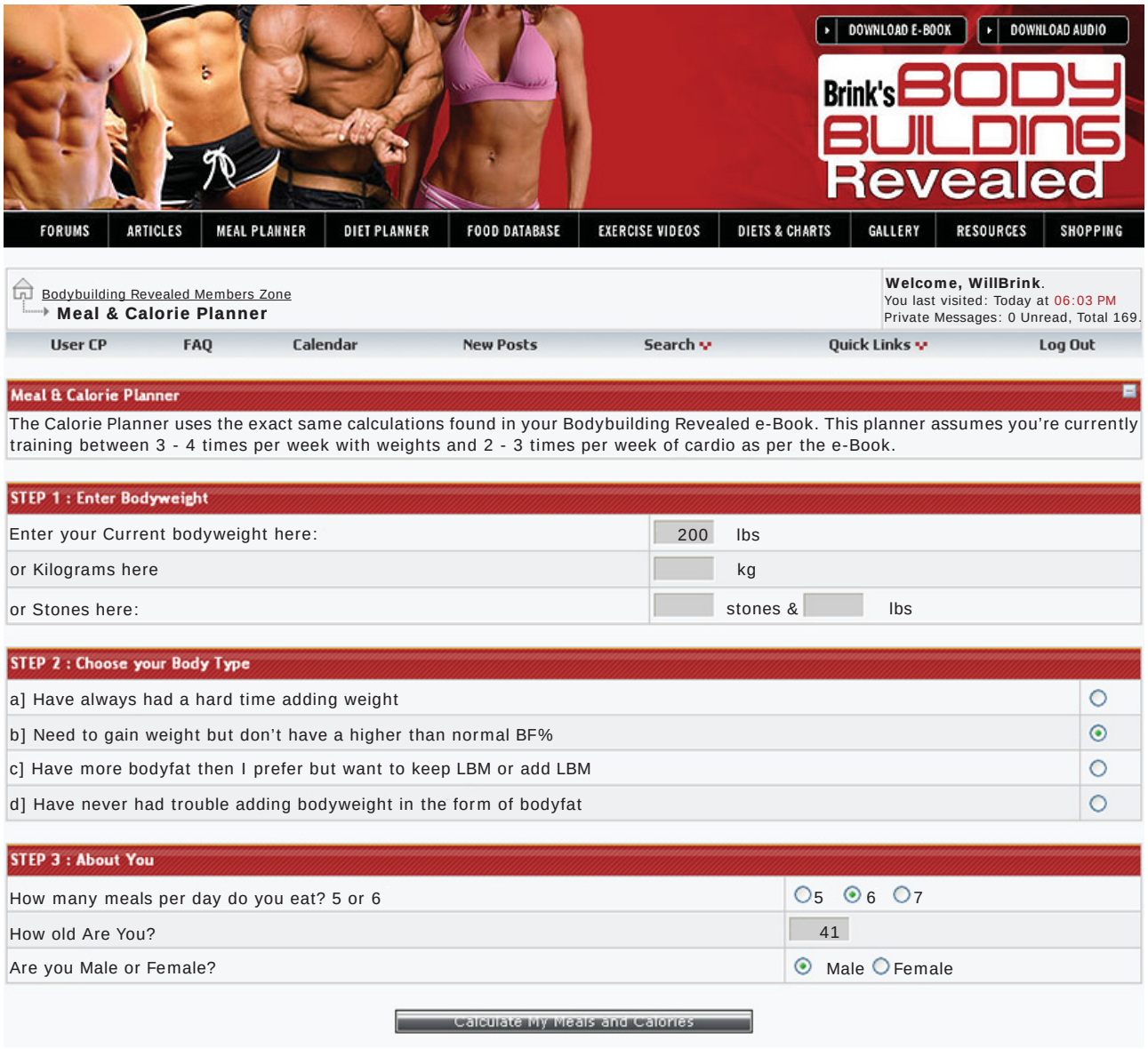
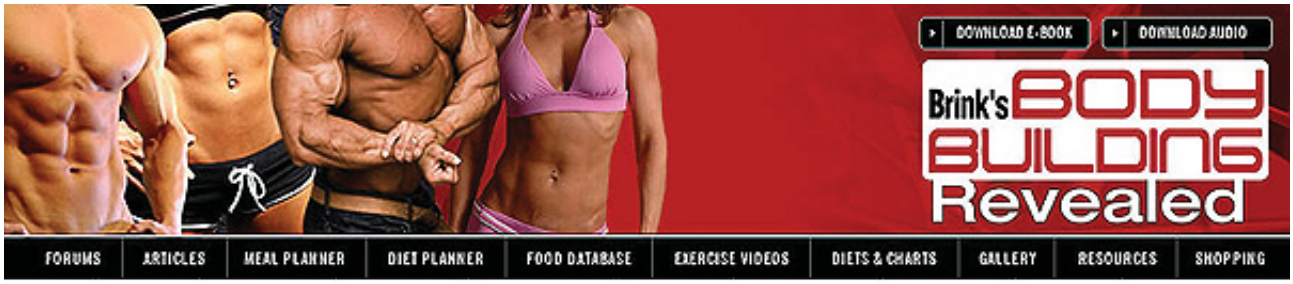


Figure 2: The user report from the Calorie Planner. The report provides info on the calories, protein, carbs, and fat to be eaten for both the full day and each meal.



Bodybuilding Revealed Members Zone > Meal and Calorie Planner
View Report

Welcome, WillBrink.
You last visited: Today at 06:03 PM
Private Messages: 0 Unread, Total 169.

User CP | FAQ | Calendar | New Posts | Search | Quick Links | Log Out

CALORIE AND MEAL PLANNER REPORT

Hi, WillBrink

You are a 41 yr old Male, you currently weigh 200 lbs (90.91 kg). You need to gain weight but don't have a higher than normal BF%.

Based on that information here is your daily macro-nutrient breakdown
for building lean muscle mass without adding unwanted body fat.

Calories:
You will need to start your diet at 3636 kcalories per day.
Your 3636 kcals should be spread over 6 meals, that's 606 kcals per meal your breakdown is below:

Protein:
You need to eat 200 g protein, spread over your 6 meals.
This equates to 800 kcals per day from protein.
This equates to 33.3 grams of protein per meal.

Fat:
You need to eat 121 grams of fat per day, spread over your 6 meals.
That will be 30% of your daily calories.
This equates to 1091 (calories) per day from fat.
This equates to 20.2 grams of fat per meal.

Carbohydrates:
You will need to eat 436 grams of carbs per day, spread out over 6 meals
This equates to 1745 kcals (calories) per day from carbs.
This equates to 72.7 grams of carbs per meal.
That will be 48% of your daily calories.

MEAL	PROTEIN	CARBS	FAT	CALORIES
Meal 1	33.3	72.7	20.2	606
Meal 2	33.3	72.7	20.2	606
Meal 3	33.3	72.7	20.2	606
Meal 4	33.3	72.7	20.2	606
Meal 5	33.3	72.7	20.2	606
Meal 6	33.3	72.7	20.2	606
TOTALS	**800**	**1745**	**1091**	**3636**

The Meal Planner also incudes a "calorie variator" function, that you can use to add or subtract 300 calories a day from your totals, and recalculate your requirements (Figure 3). Use the variator to adjust your program according to your results: if you aren't adding weight quickly enough, add calories (Figure 4). If, on the other hand, you're adding too much weight as fat, subtract calories (Figure 5). Make adjustments - if needed - every two weeks or so.

Figure 3: the Calorie Variator. Use the CV to add/subtract 300 calories from your diet and re-calculate your macronutrient targets.

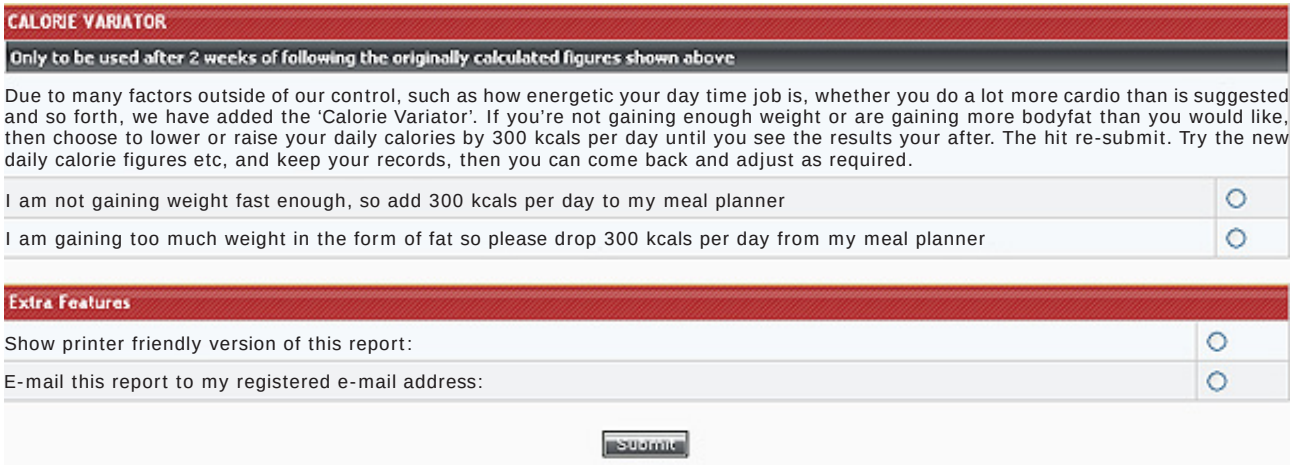


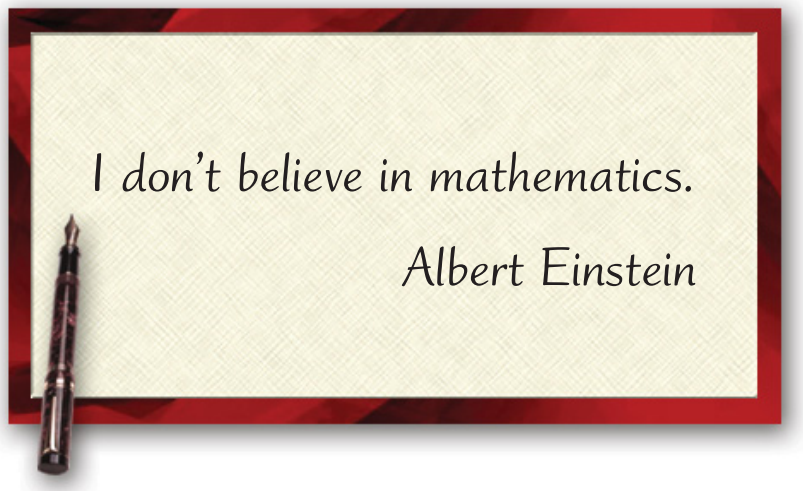
Figure 4: the results after using the Calorie Variator to subtract 300 calories/day from the example diet. Note that protein remains the same, while carbs and fat are reduced. The macronutrient ratios have also changed from 22% protein/48% carbohydrate/30% fat to 24% protein/46% carbohydrate/30% fat (full report not shown).

MEAL	PROTEIN	CARBS	FAT	CALORIES
Meal 1	33.3	64.0	18.5	556
Meal 2	33.3	64.0	18.5	556
Meal 3	33.3	64.0	18.5	556
Meal 4	33.3	64.0	18.5	556
Meal 5	33.3	64.0	18.5	556
Meal 6	33.3	64.0	18.5	556
TOTALS	**800**	**1535**	**1001**	**3336**

Figure 5: the results after using the Calorie Variator to add 300 calories/day to the example diet. Note that protein remains the same, while carbs and fat are increased. The macronutrient ratios have also changed from 22% protein/48% carbohydrate/30% fat to approx. 20% protein/50% carbohydrate/30% fat (full report not shown).

MEAL	PROTEIN	CARBS	FAT	CALORIES
Meal 1	33.3	81.5	21.8	656
Meal 2	33.3	81.5	21.8	656
Meal 3	33.3	81.5	21.8	656
Meal 4	33.3	81.5	21.8	656
Meal 5	33.3	81.5	21.8	656
Meal 6	33.3	81.5	21.8	656
TOTALS	**800**	**1955**	**1181**	**3936**

The great thing about using the Meal Planner is that it's completely integrated with another essential tool in the BBR Members' Area: The Diet Planner. The Diet Planner is designed to help you track and plan your diet. As discussed in the following chapter, the information from the Meal Planner report on your total calories and macronutrient percentages can be plugged right into the Diet Planner, so there are no calculations required.



Pre-/Post-Workout & Nighttime Nutrition

Return to T.O.C.

The recommendations made in the previous sections will provide your body with the nutrients and energy that it needs to grow. For many people, simply cleaning up their diets and eating quality food is enough. There's a growing body of research, however, that has contributed to our understanding of muscle growth, and has highlighted additional ways we can manipulate nutrition to enhance the anabolic response to exercise.

Post-Workout Nutrition

After all the high GI carb bashing I just did, the reader might think there is no place for them in the bodybuilders diet. This assumption would be wrong.

As the expression goes, "there is a time and place for everything," and there is one key time and place for high GI carbs: immediately following workouts.

Following workouts, the body preferentially shuttles glucose into the liver and muscles replacing lost glycogen via both insulin dependent and non-insulin dependent glucose transport mechanisms. This is the key time to take advantage of the one thing high GI carbs do well: raise blood sugar and insulin quickly.

Interestingly, studies have found a better insulin response when carbs and protein are mixed together post-workout over carbs alone. The combination also enhances glycogen resynthesis, protein synthesis, reduces muscle damage and reduces post-workout levels of the catabolic (muscle wasting) hormone, cortisol.

In a recent study, post-workout carbs and protein were also shown to increase expression of androgen receptors (AR) after resistance exercise (RE). The authors concluded:

"...feeding after RE increased AR content, which may result in increased testosterone uptake, and thus enhanced luteinizing hormone secretion via feedback mechanisms."

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Both laboratory experiments and direct experience have demonstrated the value of consuming a combination of high-GI carbohydrates and quickly digested protein and/or essential amino acids for enhanced recovery and anabolism following resistance exercise.

Bodybuilders have done this for years. Some bodybuilders will eat a high GI meal such as a bowl of white rice or corn flakes in skim milk, and drink a protein shake consisting of whey with it or mix a carb drink with a few scoops of protein powder. It's far more convenient - not to mention reproducible - to consume high-GI carbs and protein in the form of a drink. This is how most of the research was done, and it eliminates any delays in nutrient uptake due to digestion.

Pre-/During Workout Nutrition

Although the effects of eating various foods or supplements pre-workout and its effects on LBM are unclear, recent data suggests nutrients taken immediately before or during exercise may also play an important role.

One recent study found that pre-exercise nutrition had an even greater impact than eating post-workout. The study was designed to determine whether consumption of an oral amino acid-carbohydrate supplement before exercise would result in a greater anabolic response than supplementation after resistance exercise.

Six subjects participated in two trials in random order. The amino-carb mix consumed immediately before exercise or the same amino-carb drink consumed immediately after exercise. Blood and muscle phenylalanine (an amino acid) concentrations were increased by approximately 130% after drink consumption in both trials. Blood levels of phenylalanine during exercise increased dramatically and remained elevated for two hours after exercise in both trials.

What was interesting however was the delivery of amino acids was significantly greater when they took the amino-carb mixture pre-workout vs. when they ingested the amino-carb drink after exercise.

These researchers concluded:

"...these results indicate that the response of net muscle protein synthesis to consumption of an amino acid and carbohydrate solution immediately before

"...these results indicate that the response of net muscle protein synthesis to consumption of an amino acid and carbohydrate solution immediately before resistance exercise is greater than that when the solution is consumed after exercise, primarily because of an increase in muscle protein synthesis as a result of increased delivery of amino acids..."

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A more recent series of studies examined the effects of consuming either carbohydrate, protein, or a combination of the two during resistance exercise. The researchers found that combined consumption of carbs and essential amino acids (EAAs) significantly reduced post-exercise cortisol levels, and reduced excretion of 3-methylhistidine - a marker of protein catabolism - for up to 48 hours post-workout. In a second paper, the same group also reported greater increases in cross-sectional area of Type I, IIa, and IIb muscle fibers in the group receiving both the carbs and EAAs.

So what's the take-home lesson?

The best solution is probably to do both: consume some carbs and protein immediately before, or during your workout, and then after your workout is complete. We know from previous work that there are additive effects when more than one dose of amino acids and carbs are consumed, so it makes sense to cover all the bases.

This approach is also recommended by researchers John Ivy and Robert Portman in their recent book "Nutrient Timing". In their book, they divide the muscle growth cycle into three distinct phases: the "Energy Phase" (e.g., immediately prior to, and during the workout); the "Anabolic Phase: (e.g., the 45 minute period following the workout); and the "Growth Phase" (e.g. the subsequent hours of the day). They present compelling evidence that the right mixture of nutrients, taken at key points in the muscle growth cycle, will optimize improvements in muscle growth, strength, and power, as well as enhance recovery from exercise.

Combining pre- and post-workout nutrition received some very recent, experimental confirmation. The 10 week study by Dr. Paul Cribb compared pre- and post-workout carbs, protein and creatine consumed by a group of resistance-trained men, to a group taking the same nutrients at other times of the day. Improvements in strength and lean mass were greater in the group receiving the pre- and post-workout feedings. The study concluded:

"*PRE-POST demonstrated a greater ($P < 0.05$) increase in lean body mass and 1RM strength in two of three assessments. The changes in body composition*

were supported by a greater (P < 0.05) increase in CSA of the type II fibers and contractile protein content. PRE-POST supplementation also resulted in higher muscle Cr and glycogen values after the training program."

Specific grams of carbs per kg of body weight formulas exist for pre- and post-workout carbohydrate intake. Protein recommendations are more variable, although it would appear that an amount that provides at least 6 g of essential amino acids is appropriate. A formula containing 1.0 g/kg high-GI carbs and 0.5 g/kg whey protein will easily cover the needs of most people. This amount should be split between your pre- (or during) and post-workout drinks.

Pre- and post-workout sample calculation:

To figure out how many grams of carbs and protein you'll need using the pre-/post-workout formula, you take your weight in kg. For our 200 lbs example:

Weight in kilograms: 200 lb. / 2.2 = 90.9 kg

multiply this number by 1 g/kg to get the grams of carbs, and 0.5 g/kg to get the grams of protein.

91 x 1 g/kg = 90.9 grams of high-GI carbs
91 x 0.5 g/kg = 45.5 grams of protein (whey, hydrolyzed whey)

To make the measuring and math easier, we can round these numbers up to 92 g carbs and 46 g protein. Divide into two equal portions, half for pre-workout and half for post-workout (e.g. 46 g carbs and 23 g protein for each). Together, the pre- and post-workout drinks replace one of the 6 meals our example eats each day.

Subrract the grams of carbs and protein from your totals for the day. The remaining protein, carbs, and fat will be evenly divided over the five remaining meals.

Protein: 200 g - 46 g = 154 g. 154 g/5 meals = 30.8 g per meal
Carbs: 436 g - 92 g = 344 g. 344 g/5 meals = 68.8 g per meal
Fat: 121 g/5 meals = 24.2 g /meal

If you'd like to keep it simple though, mix 30 - 50 g of high quality whey with 75 - 100 g of high GI carbs (such as glucose, maltodextrin, etc.,) and 3 - 5 g of creatine monohydrate and drink half immediately before you hit the gym, and the other half immediately following your workout. If you're 160 - 200 lb., use the lower end of the range; over 200 lb., use the higher numbers. The pre- and post-workout drinks should contain as little fat as possible, as dietary fat will slow down the absorption of the high GI carbs and proteins.

These grams of carbs and protein would of course be subtracted from the day's calorie and macronutrient totals. Depending on your weight, the pre-and post-workout drinks may add up to more, or less than your other meals. The tables below illustrate how you adjust your intake to match.

Figure 6. Example of a non-training day: the calories , protein, carbs and fat are simply split up equally throughout the 6 meals. If you choose to eat 5 or 7 meals daily then you would calculate your splits accordingly. In this example 'Meal 5' stays the same in calories, protein, carbs and fat.

Meal	Protein	Carbs	Fat	Calories
Meal 1	33.3	72.7	20.2	606
Meal 2	33.3	72.7	20.2	606
Meal 3	33.3	72.7	20.2	606
Meal 4	33.3	72.7	20.2	606
Meal 5	33.3	72.7	20.2	606
Meal 6	33.3	72.7	20.2	606
Totals	**800**	**1745**	**1091**	**3636**

Figure 7. The formula of 1 g/kg carbs and 0.5 g/kg protein has been used in this example for pre- and post-workout nutrition: the total has been divided between the two, which are being used in place of Meal 5. As you can see the fat calories not used for pre- and post-workout have been added to the other meals. Protein and carbs from the other 5 meals have also been reduced to account for the additional carbs and protein used in the workout drinks. Total calories and macronutrients, however, stay the same.

Meal	Protein	Carbs	Fat	Calories
Meal 1	30.8	68.8	24.2	617
Meal 2	30.8	68.8	24.2	617
Meal 3	30.8	68.8	24.2	617
Meal 4	30.8	68.8	24.2	617
Pre-Workout	23.0	46.0	0.0	276
WORKOUT/EXERCISE				
Post-Workout	23.0	46.0	0.0	276
Meal 6	30.8	68.8	24.2	617
Totals	**800**	**1745**	**1091**	**3636**

Nighttime Nutrition

Eating every 3 hours or so has the effect of providing your body with a steady stream of nutrients throughout the day. Small, frequent feedings of high-quality protein maintain the amino acid levels needed to repair and build new muscle.

Needless to state, this process is interrupted at night, by sleep. Once the final meal has been digested and absorbed, no more food is eaten until the next morning. And even though you're sleeping, your body still uses energy. Other biochemical processes continue as well. During the postabsorptive state, the needs of the body must be met using stored nutrients. Although protein synthesis still occurs, the body enters a net catabolic state. By morning, the rate of protein degradation is greater than protein synthesis. Skeletal muscle contains nearly one-half of the total body protein and plays an important role in maintaining the free amino acid pool during this period.

Feeding eventually restores the balance between protein breakdown and synthesis, although it would be nice to find some way to prevent - or at least reduce - the amount of muscle protein breakdown during sleep.

In the supplement section review of casein, I discussed a study, "Slow and fast dietary proteins differently modulate postprandial protein accretion", that examined the impact of protein digestion rate on protein synthesis and breakdown. The researchers compared whey to casein. What they

found was that a quickly digested protein like whey was better for increasing protein synthesis, while a slow digesting protein like casein resulted in a much lower, prolonged enhancement of amino acid levels - which wasn't very effective for boosting synthesis, but was good for preventing protein breakdown.

So there's a possibility that a small amount of a slow protein like casein, consumed at bedtime, would maintain amino acid levels sufficiently to blunt the catabolic effects of fasting on your muscles while we sleep.

Is there any proof at this point that having a "bedtime snack" will result in extra pounds of muscle? None at all. In view of the research, my take is that a snack before sleep is a wise precaution, but strictly optional.

Does it have to be casein? Maybe not. Most animal proteins digest much more slowly than whey does. But casein is an extremely large protein, and associates with other caseins to form large complexes that gel in the stomach and are especially difficult to digest. So, unless you're allergic to it, casein is probably one of the best proteins you could use for this purpose.

A good bedtime snack will contain about 30 - 50 g of protein, with minimal carbs. A small amount of healthy fat could be added to slow digestion even further. It doesn't need to be elaborate: this isn't a full meal. A couple of scoops of a casein-based protein powder or some cottage cheese should do the trick.

These nutritional enhancements won't work miracles, of course. If your training and/or nutrition over the rest of the day aren't up to snuff, consuming pre-/post-workout drinks and eating a bedtime protein snack won't make up for those shortcomings. In conjunction with a good training program and diet however, these additions have the potential to add to your success. It's your entire program of nutrition, supplementation and training that will bring success, not one or two simple changes.

Just remember, it's not rocket science, so don't make it any more complicated then it needs to be.

To discuss Pre-/During or Post-Workout Nutrition further, you can post in the Members' Area.

Click Here

"If your training and/or nutrition over the rest of the day aren't up to snuff, consuming pre- and post-workout drinks won't make up for those shortcomings. In conjunction with a good training program and diet however, combining pre- and post-workout nutrition will clearly add to your suc-

Putting It All Together

Return to T.O.C.

In a nutshell, here's how you put together your nutrition plan:

- Determine the number of calories you'll start with, based on your body weight (in kg) multiplied by the numbers from the table in the "Simple Method" or using the Meal Planner tool in the BBR Members' Area.
- Decide on the grams of protein needed, e.g., 1 g per lb. of body weight.
- Decide on the fat content of the diet, which is 30% of the total calories calculated. Follow the "One-Third Rule" as outlined in the section on fats. Divide the fat calories by 9 to get the grams of fat you need per day.
- Decide on carb content of your diet, which is simply the amount of calories you have left after you subtract your protein and fat needs. In the sample calculation, this worked out to about 50% of total calories, although this will vary from person to person. Divide your carb calories by 4 to get the grams of carbs you need per day.
- Divide your calories and macronutrients between 5 - 7 meals per day.
- Eat your first meal immediately on waking up. Additional meals should be eaten approximately every 3 hours throughout the day.
- Choose the foods you eat from the lists of recommended sources of protein, fats, and carbohydrates in Chapter 1.
- Follow pre- and post-workout nutrition recommendations, and consume a small amount of slow digesting protein prior to sleep.
- Train hard and gain quality weight!

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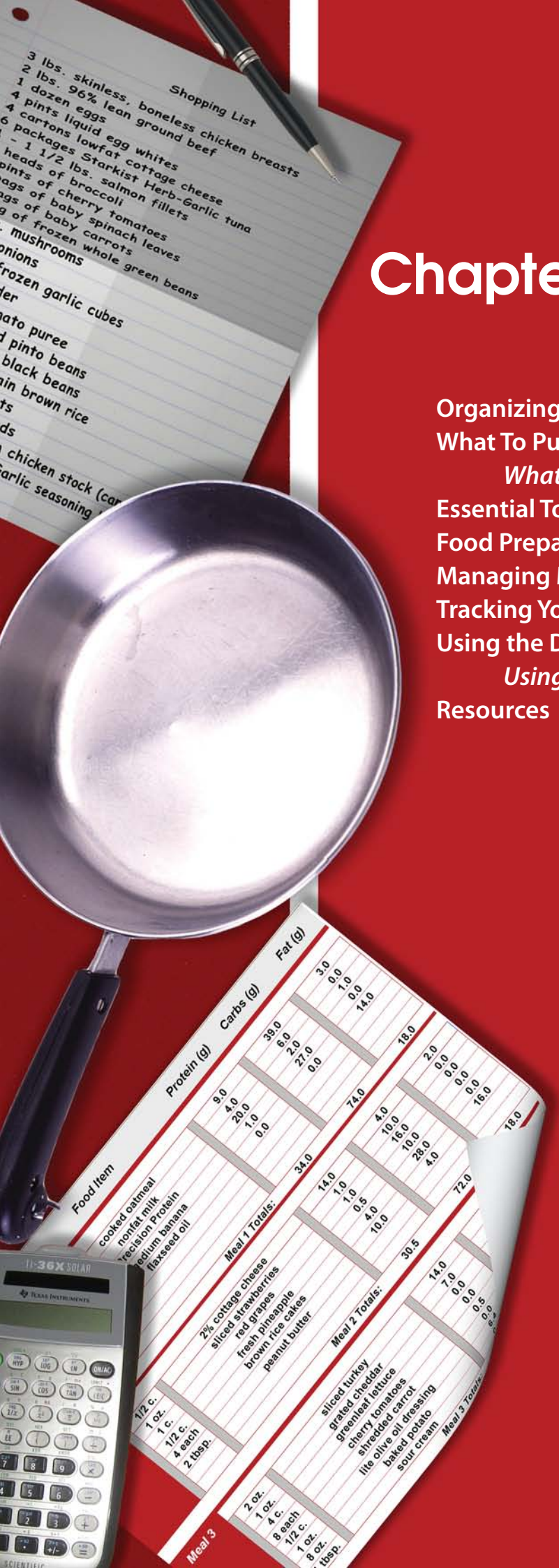


Chapter 3: Getting Organized

Organizing Your BBR Kitchen

Return to T.O.C.

Congratulations! You've put together what looks like the ideal nutrition plan. It's perfectly balanced, and packed with all the essentials. The only barrier now between you and pounds of new muscle is...reality. Working it all out on paper is a critical first step. Putting your plan into action is the next one.

There's often a gap between knowing what to do, and knowing how to do it. In this day and age, many have trouble eating 3 good meals a day, let alone 5 or 6! Fitting good nutrition into a busy lifestyle requires thinking ahead. The good news is that a little organization can make it quite manageable – even easy. The next stage in your planning is to make it all fit into your lifestyle.

Fortunately, the BBR plan is based on readily available whole foods, rather than exotic, expensive, or hard-to-find products. Filling the fridge and kitchen cabinets with recommended foods won't be difficult, although you'll want to be organized so that your trips to the store are as efficient as possible. There's nothing worse than needing something to eat NOW - but not having the foods on your plan within reach. And if you want to add LBM, raiding the office vending machine or skipping meals aren't options. You need to plan your shopping around several days' worth of menus in order to keep your program from collapsing.

Preparing food in advance is another important consideration. It's virtually impossible to prepare and cook 5 - 6 meals/day right before you want to eat them: even if you had the time, the routine would quickly become a burden. A few simple steps to maximize the time you have, however, will easily take care of the problem.

Finally, you need to be sure that you're eating what you're supposed to. Even healthy foods will contribute to fat gains if you eat too much of them. You need to monitor your portions: a gaining diet isn't a free-for-all. Make sure you have what you need to assess what you're eating before you begin.

Shopping, food preparation, and portion control aren't particularly exciting subjects, but they can make or break your efforts in the gym!

"It's virtually impossible to prepare and cook 5 - 6 meals/day right before you want to eat them: even if you had the time, the routine would quickly become a burden. A few simple steps to maximize the time you have, however, will easily take care of the problem."

What To Put Into Your Shopping Cart

Return to T.O.C.

In Chapter 1, I made recommendations for various foods that are optimal sources of protein, fats, and complex, low-GI carbohydrates. I kept those recommendations brief, since we were discussing concepts. But this chapter is about the practical side of adding LBM: you need details on what to buy. So I put together a list of foods to give you some ideas.

Do you remember the Food Pyramid from Chapter 1? Here's where it all comes together in your shopping cart. Starting from the base of the pyramid, we have:

Lean Proteins	
Lean ground beef (> 96% lean)	Other red meat (ostrich, buffalo)
Flank steak	Salmon
Beef tenderloin/top loin	Halibut
Eye-of-round roast	Sole/cod/tilapia
Top/bottom round/round tip	Tuna steak/mahi-mahi
Skinless turkey breasts	Red snapper
Skinless chicken breasts	Shellfish (shrimp, scallops, crab)
Water-packed tuna	Egg whites
Pork loin/tenderloin	Nonfat/lowfat cottage cheese
Lean wild meat (elk, venison)	> 50% Reduced fat cheeses

My definition of a "lean" protein source is one that has no more than 35% calories from fat (6 - 7 g fat/serving).

Don't be fooled by ground beef that has "only" 20% fat. Remember, what we need to consider is the percentage of calories from fat - not the percentage of fat by weight. Gram-for-gram, fat has over twice as many calories as protein does - so the percentage of fat on the label can be deceptive. In the case of 80% lean ground beef, a 100 gram (approx. 3 1/2 oz) portion of cooked meat contains a whopping 17+ grams of fat - which accounts for nearly 60% of the total calories.

In other words, 80% "lean" isn't very lean at all!

Many gourmet and specialty stores and farmers' markets carry more exotic meats like venison, ostrich, and buffalo (usually frozen). Buffalo is generally leaner than beef, although double check the labels: I've seen frozen ground buffalo that had nearly as much fat as commercial (15% fat) ground round.

Healthy Fats	
Almonds/Almond butter	*Udo's Choice*/Flax Oils
Walnuts	Peanuts/Peanut butter (natural)
Sesame seeds	Avocados
Pumpkin seeds	Extra-virgin olive oil
Flax seeds	Cold-pressed vegetable oils

Items like cold-pressed, unrefined vegetable oils are more readily found in health food stores than in your typical supermarket.

The term "extra-virgin" refers to the level of the acidity in the oil: both virgin and extra-virgin oils are first press oils that have not been chemically treated, and contain heart-healthy polyphenols.

Low GI/High Fiber Carbohydrates	
Oats/Oatmeal	Pinto beans
Brown rice	Black beans
Barley	Navy/Great Northern beans
Buckwheat	Split peas
Bulgar	Aduki beans
100% Whole grain breads	Kidney Beans
100% Whole grain pasta	Chickpeas (Garbanzo beans)
Quinoa	Blackeyed Peas
Whole wheat/Spelt/Kamut	Corn
Lentils	Sweet Potatoes/Yams

Health food stores are good places to find interesting and alternative grains and legumes - they offer more variety than your typical supermarket. It's also possible to order from online sources.

Fresh, Fibrous Vegetables & Fruits	
Spinach	Strawberries
Kale/Chard	Raspberries
Broccoli	Oranges
Broccoli Sprouts	Grapefruit
Romaine lettuce/Arugula	Tangerines
Cabbage	Cantaloupe
Cauliflower	Watermelon
Green Beans	Peaches
Carrots	Apricots
Asparagus	Mango/Papaya
Mushrooms	Pineapple
Peppers	Apples
Tomatoes	Kiwi Fruit
Blueberries	Red/black grapes

Frozen vegetables and fruits can be substituted for fresh in many cases. There are times when frozen veggies or fruits might be preferable to fresh. Frozen foods are typically processed shortly after harvesting, whereas out-of-season produce may need to travel long distances before reaching your supermarket. Some of the more fragile nutrients can be reduced over prolonged storage. If you do buy frozen vegetables and fruits, read labels carefully: many fruits have added sugar, while veggies may have added sodium or sauces made with unhealthy fats.

Performance Supplements	
Whey Protein	Probiotics
Casein	Creatine Monohydrate
Amino Acids (Glutamine, etc.)	MRPs
Fish Oil	Antioxidants
Multivitamins/Minerals	Dextrose/maltodextrin

Very few diets are 100% perfect, day-after-day. While they shouldn't be used to replace things missing in the diet, supplements provide some insurance when your intake is less than optimal. Supplements are also need-

ed if you want certain nutrients in amounts that would be difficult - if not impossible - to get from diet alone.

Online sources offer the best prices and variety for supplements. The supplements from health food stores and other retail outlets are frequently overpriced, and of lesser quality.

Be very wary of supplements offered through multi-level marketing companies. The vast majority are overpriced and under-dosed.

Saturated Fats	
Natural cheeses (Cheddar, etc.)	Whole milk
Whole eggs	Coconut/red palm oils
Liver	Butter

It might seem odd to find foods higher in saturated fats on a shopping list of recommended bodybuilding foods, but the reality is the foods on this list all have some redeeming characteristics. Cheeses, egg yolks, liver, and whole milk also provide valuable nutrients. Obviously, these should not be overdone, but modest amounts can be useful in a bulking diet.

Butter and tropical oils are highly saturated, and are far more heat stable than polyunsaturated oils for cooking - which are best kept refrigerated and used fresh for salad dressing, etc. While deep fat fried foods are verboten, a dab of butter, etc. can be used for gently sauteing veggies and meat, scrambling eggs/whites, etc. Boiling/baking all your food all the time is pretty boring.

Some health benefits have also been attributed to coconut and red palm oils. While some of these claims are clearly overblown, there is research that points to certain health benefits. In limited amounts, they are far more healthful than the processed cooking oils most people use.

Moderate-High GI and/or Low Fiber Carbohydrates	
White/Red potatoes	Plain yogurt/kefir
Bananas	Soymilk (unflavored)
Milk (nonfat/1%)	Orange juice

As in the saturated fat list, the foods here have things to offer to a healthy diet, in spite of some drawbacks. This is a more heterogenous group: some foods, like milk, plain yogurt and kefir, actually have a low GI, but have a high insulin index - in other words, they raise insulin in the absence of a corresponding increase in blood sugar. But they also supply calcium and vitamins, as well as complete protein. The carbs in orange juice and bananas are mostly from simple sugars, but both are good sources of potassium, minerals and vitamins. Unsweetened soymilk is actually low in carbs, but even unflavored "plain" soymilk typically contains cane syrup sweeteners - so read the label before you buy. Soymilk provides some protein (decent for a plant source), and also contains isoflavones, which have cardioprotective effects.

Miscellaneous Items (Condiments)	
Green tea	lemon juice
Soy sauce	vinegar
Salsa	Tomato sauce/puree/paste
Herbal seasoning blends	Cocoa powder
Vanilla (or other flavor) extract	Sweeteners (Stevia, etc.)
Spice rubs or marinades	Reduced sodium salt blends
Dijon mustard	Garlic
Fresh and dried herbs	Ginger, cayenne and other spices

These can be used to add flavor to recipes. Various herbs and spices are healthful additions as well. Many herbs contain valuable phytonutrients.

Train yourself to read ingredient labels: many common condiments are often loaded with sugar (e.g. catsup and barbecue sauce), made with refined cooking oils (e.g. most salad dressings and mayonnaise), or contain undesirable preservatives or other compounds.

What About Convenience/Packaged Foods?

There are many commercial products that require little or no cooking or other preparation. Some of them can be useful, but need to be evaluated on a case-by-case basis. Canned soups, for example, are notoriously high in sodium, as are many frozen entrees and deli meats. Canned vegetables and fruits are not the nutritional equivalent to fresh or frozen. Ready-to-eat cereals often contain hidden sugars and contain potentially harmful compounds formed from reactions between the sugars and proteins during heat processing.

On the other hand, certain products can be useful, such as marinara sauce, single serving packets of pre-seasoned tuna, pre-made hummus or guacamole, salad dressings and/or mayonnaise made from unrefined oils, etc.

It's important to read labels - both the nutrition information and ingredients - to determine if a particular item is acceptable. Check to see if the product has excess fat, sodium, added sugars and high-fructose corn syrup, partially-hydrogenated oils, or an unnecessarily high number of food additives.

Beware of the terms "natural" and "organic". Cookies made with white flour from organically-grown wheat and "natural" cane sugar aren't healthier than their food-industry produced counterparts. Buying something in a health food store is no guarantee that it's healthy.

Protein bars are heavily marketed to athletes, and are portrayed as the the equivalent of a meal. In my opinion, the best protein bars are the ones you make yourself - there are a lot of great recipes for these in the Members' Area forum. If you want to use a commercial bar as an occasional snack, however, once again: read the label. Many "high protein" bars contain substandard protein sources, such as soy isolate and hydrolyzed gelatin. The same holds true for many "weight gainers" which use sugars and/or maltodextrin as carb sources. While these might be suitable for pre- or post-workout nutrition, they don't make good meal replacements. Unless you have the metabolism of a wolverine, the weight you gain is more likely to be around your midsection, rather than your delts and biceps.

"Beware of the terms "natural" and "organic". Cookies made with white flour from organically-grown wheat and "natural" cane sugar aren't any healthier than their food-industry produced counterparts. Buying something in a health food store is no guarantee that it's healthy."

Essential Tools And Equipment

Return to T.O.C.

If you're a novice in the kitchen, the prospect of preparing even 3 meals a day - let alone 6 - can be pretty intimidating. This list is for you. To prepare, cook and store your food, some basic hardware is needed. While you can go as high-tech and fancy as you wish, you can get the job done with a collection of basic - and generally inexpensive pieces.

Cookware set: a basic set consists of at least one each of:

- 1 quart saucepan with lid
- 2 quart saucepan with lid
- 4 quart saucepan with lid
- 8" - 9" nonstick skillet
- 12" nonstick frying pan

Obviously, this can be added to, with items such as a 6 quart stockpot, a roasting pan, or specialty items such as a wok.

Knife set: a good, sharp set of knives can make a world of difference when it comes to preparing food. You should have:

- 3" - 4" paring knife
- 6" - 7" serrated knife
- 8" carving knife
- cleaver
- sharpening steel or whetstone

Measuring cups and spoons: It can be handy to have more than one set of metal or plastic measuring cups - they make excellent scoops.

Mixing bowl set: a standard 3 piece set consists of 1 1/2, 2 1/2, and 5 quart sizes.

Pyrex or CorningWare casseroles with lids: The 1 1/2 and 2 1/2 quart sizes are excellent for microwave cooking.

Blender: A blender is especially useful for shakes and smoothies.

Pyrex or stainless steel baking set: The pyrex type often come with fitted plastic lids, so they can also double as storage containers.

Crock pot: A 4 quart electric crock pot can be a lifesaver. Not only can it be used for slow-cooking soups and stews, but it can even "bake" potatoes, or double as a rice cooker.

Coffee grinder: Perfect for grinding flaxseed and other nuts/seeds. If you're a fan of grinding your own coffee beans, buy a second one for grinding other foods.

Heavy duty plastic chopping boards: These should be at least 1/2" thick to avoid cracking with extended use. Plastic is considerably easier to clean than wood.

Storage containers with fitted lids: Buy various sizes from large for holding bulk food, to small, single serving containers.

Salad Spinner: Fantastic for prepping salad greens and veggies. In addition, the removable interior basket can double as a colander for draining pasta, etc.

Kitchen scale: Battery-operated digital scales are ideal, but more expensive than the plastic, manual type, but worth it.

Basic hand tools: You should have on hand:

- Grater
- Set of 2 - 3 rubber scrapers
- 2 - 3 spatulas
- 10" wire whisk
- Can opener
- Potato/veg. peeler
- Heat-resistant plastic utensils (safe for nonstick cooking surfaces)

There are other items, of course, that are nice to have around, like a food processor, electric mixer, pressure cooker, etc. but are non-essential.

The list of tools and equipment above should cover the bases for efficient food preparation and storage. If you're on a tight budget, look for good used items at garage sales and thrift stores.

Food Preparation Tips

Return to T.O.C.

Preparing 5 - 7 balanced meals a day, seven days a week, sounds like a full time job. And if you had to make only one meal at a time, it would be. Fortunately, a little advance planning will save you both time and energy when it comes to making meals. The meals you eat on the BBR program can be quickly and easily assembled simply by following a few basic guidelines.

- ***Cook in bulk:*** Cooking foods in larger amounts is invaluable for meal planning. In the time it takes to cook one chicken breast, you can cook 6 - 8, and have the leftover meat available for eating as is, or ready to use in recipes. Many lean protein sources can be pre-cooked and stored for later use: chicken and turkey breasts, pork tenderloin, lean roast beef, seafood, etc. Even if you're a single person, you can make recipes in larger amounts, and refrigerate or freeze the leftovers in single-serving containers. Soups, chili, stews, casseroles, meatloaf, etc. are ideal for bulk cooking and storage. It shouldn't be necessary to purchase commercial canned soups or frozen entrees to accommodate a single appetite.

  Starchy carbohydrate foods like brown rice, other whole grains, and legumes can also be pre-cooked, and used for several different meals. You can also make ahead and freeze homemade protein bars, pancakes, and quick breads for snacks/meals. The recipe section in the Members' Area forum has a number of recipes you can make ahead and store for snacks and meals.

  Visit the recipe section in the Members' Area:

  Click Here

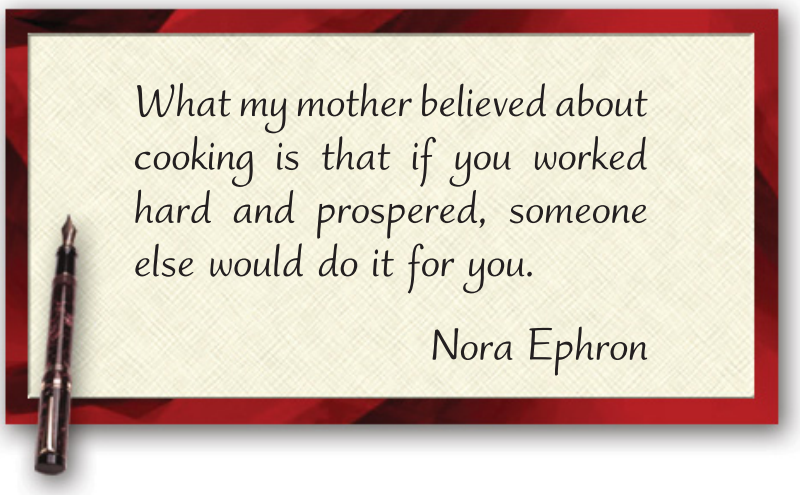
- ***Make use of precut, ready-to-eat, and frozen vegetables/fruits:*** Larger vegetables such as broccoli or cauliflower can be precut and stored in resealable plastic bags for eating raw, or adding to recipes and salads. Ready-to-eat vegetables such as peeled baby carrots and grape/cherry tomatoes are also handy. Frozen vegetables are an alternative to fresh, and are often more nutritious and less expensive than out-of-season, "fresh" vegetables shipped in from miles away and stored for

long periods of time. It takes only moments to put a cup or two of frozen or precut veggies into a microwavable dish. Use bagged, prewashed baby spinach leaves and other salad greens, or make/bag your own bulk, ready-to-eat salad.

- ***Use Your Blender:*** Keep bags of frozen, unsweetened berries (particularly blueberries) and other fruit in the freezer for adding to homemade MRPs/smoothies. Add protein powder, ground flaxseeds/flax oil, and other ingredients for a fast meal-in-a-glass.

- ***Make use of acceptable ready-to-eat products:*** Keep single serving containers of cottage cheese, low-carb or light yogurt, reduced-fat string cheese, pre-seasoned tuna, and MRP packets around for fast, portion-controlled snacks and/or office meals. Other pre-made foods such as hummus, guacamole, pre-cooked rotisserie chicken, reduced sodium, low fat deli turkey/chicken breasts and lean roast beef can also be used. Foods that don't require preparation, like whole grain crispbreads, nuts/seeds, and fruit can be used to round out quick meals.

With a little practice, you'll find that you can minimize shopping trips, and plan your eating 3 - 4 days in advance, without having to eat the same menu over-and-over again, 7 days a week.



Managing Meals Away From Home

Return to T.O.C.

I think it's safe to say that most of the people reading this book have other things to do besides lift weights and prepare meals. Having other priorities often means that you spend at least part of the day away from home. So your nutrition plan needs to be thoroughly integrated into your lifestyle if you're going to make progress.

In order to manage, you need to either a) bring food along with you; b) rely on restaurant meals of some sort; or c) both.

Packing food with you isn't difficult, if you have the right supplies. Invest in an assortment of single-serving, reusable containers, a wide-mouth thermos, blue ice packs, resealable storage bags (various sizes), shaker bottles, and a soft-sided insulated cooler or large lunch bag. Having these items on hand means you can take your diet with you to your job - you don't need to rely on kitchen facilities, or the office refrigerator/microwave.

As for what to bring...well, you're limited only by your imagination and the amount of time you have available to eat. If you've cooked ahead of time, then there will always be some ready-to-eat meat in the fridge - leftover boneless chicken breasts, lean roast beef, or a turkey breast. Sliced cold meats can be eaten plain or put into a sandwich (pita sandwiches or wraps w/lo-carb tortillas are good variations). Add variety to sandwiches with different condiments: choose from an array of gourmet mustards or more exotic items like wasabi, pesto, and satay sauces. Leftover meat can also be chopped up and used to create salads - these take only seconds to scoop into a container for munching later on.

Side dishes that are easy to prepare (or buy) ahead and store well include: tabouli, hummus, potato/pasta salads, marinated vegetable salads, various (reduced fat) cheeses, cottage cheese, yogurt, pre-cut veggies/dip, grape tomatoes, hard boiled eggs, fresh or dried fruit, seasoned tuna packs, nuts/seeds, peanut/nut butters, baked tortilla chips, whole grain crackers/crispbreads.

If you have access to a microwave, various other entrees (such as leftover soups, stews, or casseroles) can be packed along. You can also pre-assemble a "rice bowl" (use pre-cooked brown rice, pre-cut fresh or frozen veg-

"As for what to bring...well, you're limited only by your imagination and the amount of time you have available to eat."

gies, diced pre-cooked meat - add a dash of soy sauce and toasted sesame seeds or other seasonings), then simply heat and eat.

If you don't have time for full meals, you can "graze" on snacks throughout the day: make some of the protein bars from the recipe section ahead of time for packing along. Other snack/quick foods might include InStone "high protein" pudding and Ostrim sticks - which are portable and non-perishable. Ditto fruit and nuts. Or bring an MRP packet and a shaker bottle along. Push comes to shove, a commercial protein bar can also be used.

Restaurant meals can be both easier - and harder - to deal with. On the one hand, there's no preparation involved; on the other, it's sometimes difficult to eat according to your nutrition plan. You can't weigh or measure anything, so it's harder to estimate what you're eating - or overeating. If you eat out only sporadically, the occasional restaurant meal is no big deal. On the other hand, if you eat out on a regular basis, surplus calories that aren't compensated for by reductions in other meals/snacks could result in fat gains.

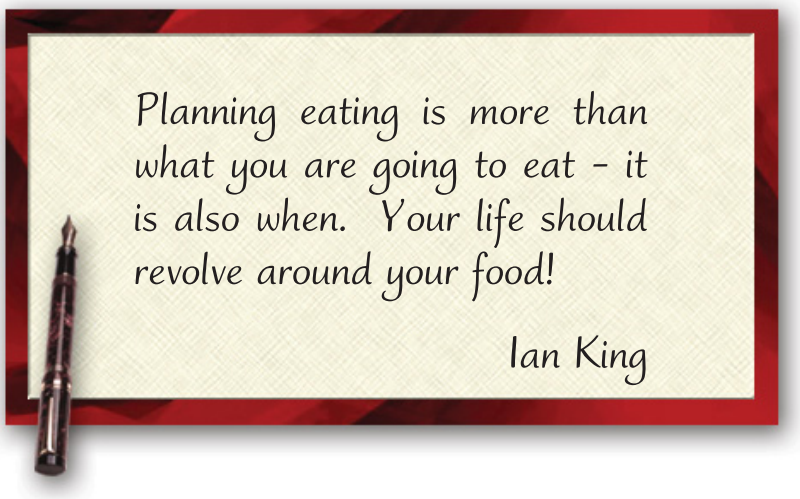
Beyond ordering recommended foods as often as possible, you can estimate your intake using the following guidelines:

Food	Serving Size	About the size of...
Meat, Poultry, Fish	3 ounces	Deck of cards or the palm of your hand
Pasta, rice	1/2 cup	Small computer mouse or the size of your fist
Cooked vegetables	1/2 cup	Small computer mouse
Fruit	1/2 cup	Small computer mouse or a medium apple
Cheese	1 1/2 ounces	A "C" battery or your thumb

From the American Dietetics Association, Nutrition Fact Sheet: "Clearing Up Calorie Confusion"

Traveling presents its own set of complications, as most of the time, you're stuck with restaurant meals, and your schedule isn't likely to permit you to eat 5 - 7 meals per day. The best solution in a situation like this is to a) follow the basic guidelines for dining in restaurants; b) pack a shaker bottle, some MRPs, and some (better-quality) protein bars; and c) if possible, hit a supermarket and pick up some supplies of non-perishable snack foods: nuts, single serving packets of tuna, salmon, or chicken, fruit, and whole grain crispbreads.

If your hotel room has a refrigerator, you have more latitude for storing small containers of cottage cheese or yogurt, sliced deli turkey or roast beef, reduced fat sliced cheeses, and precut veggies. RTDs, protein bars, and nuts are non-perishable and can be carried around with you in a purse, backpack, or briefcase. These are especially useful in airports and on planes, when there may not be anything more than junk food available.



Tracking Your Intake

Return to T.O.C.

Keeping tabs on what - and how much - you eat is critical to your success. It doesn't matter if you're a hardgainer, someone who gains weight easily, or someone in between. You need to know what you're doing, while you're doing it. If things are going well, your records serve as a template for success you can duplicate down the road, or pass on to someone else. And if things aren't going according to plan, you need to make changes. If you don't know precisely what you're doing, how will you know what to change?

Think of a gaining program as an experiment. When a scientist conducts an experiment, he/she collects data. The data holds the key to the results, whether the experiment is a success or failure.

Do I need to spell it out in more concrete terms? If it goes into your mouth, then W-R-I-T-E I-T D-O-W-N. Write down what you ate, how much of it, how many calories it has, and the the grams of protein, carbs, and fat.

Putting it down on random scraps of paper won't do, though. The info needs to be kept in one place. You need to create a permanent food log.

A food log can be as simple as a pencil and a spiral-bound notebook. Excel spreadsheets work well too.. There are also a variety software programs that you can purchase, or use online for a small fee. How you do it is less important that the fact that you do it.

I'll be the first to say it: keeping tabs on your diet can be a PITA. When you're trying to fit 6 meals a day into an already hectic schedule, all the weighing and measuring and writing everything down is just one more complication. It's truly worth the effort, though, if your goal is to make solid gains while limiting fat. The trick is to find ways to simplify and streamline the process.

Fortunately, one of the best and most convenient tools to use is already in the BBR Members' Area: the Diet Planner. The Diet Planner was created specifically for BBR members. The Diet Planner is more than just a tracking tool, however: you can also use it to plan and optimize your diet. It's worth taking a look at it in more detail.

"I'll be the first to say it: keeping tabs on your diet can be a PITA. When you're trying to fit 6 meals a day into an already hectic schedule, all the weighing and measuring and writing things down is just one more complication. It's truly worth the effort, though, if your goal is to make solid gains while limiting fat. The trick is to find ways to simplify and streamline the process."

Using The Diet Planner

Return to T.O.C.

The first thing you see when you open the Diet Planner is a page with a link to the FAQs. The FAQs provide detailed instructions on how to use the Planner to create and store meals.

To read the Diet Planner FAQs:

Click Here

To go to the Diet Planner:

Click Here

To illustrate how the Diet Planner works, we'll continue with the example we used in Chapter 2 for a 200 lb. person, using the same values for calories and macronutrients we originally calculated with the Meal Planner: 3636 kcal/day, and 22% protein, 48% carbohydrate, and 30% fat.

To create a diet, click the "Create New Diet" button. On the set up page, you'll need to:

- Enter a name (title) for the diet
- Choose whether to make the diet "Public" (visible to other members) or "Private" (visible only to the user)
- Select how each day will be ordered. Each day can be given a date, or a title (i.e., "Day 1," "Day 2," etc.)
- Enter a daily calorie goal (3636)
- Enter a "Macronutrient Split Goal." Macronutrient splits are the percentages of the total calories from protein, carbs, and fat (22% protein, 48% carbs, and 30% fat)
- Enter current body weight (200 lb.)

Details such as the calorie goal, macronutrient targets and body weight are

not fixed, but can be changed as you proceed.

The Diet Planner also provides a space for notes or other details about the diet. Clicking on "Save Diet" completes the process. Now it's ready to use for meal planning and tracking.

Each new line in a meal has a drop down list of foods. When you choose a food from the list, the number of calories and grams of protein, carbs, and fats are automatically added. The basic list of foods is limited, but users can customize the list by adding their personal favorites. Click "Add" to enter the food into the meal you're creating.

Using the values we calculated for a 200 lb. person in the previous chapter, we'll use the Diet Planner to create a meal that contains approximately 606 calories, 33.3 g protein, 72.7 g carbohydrate, and 20.2 g fat.

The simplest way to build a meal is to start with the main protein source. Choose a protein food and enter a portion size that gives a value less than the final amount you want for the full meal, since other foods will add some protein as well.

Step 1: Start with a protein source.

Create New Meal — **Load Meal From Favorites**

#	Food	Calories	Protein	Carbs	Fat	
1	Large Whole Egg(s) PROTEINS	75	6g 32%	1g 5.33%	5g 62.67%	✕
3	Large Egg White(s) PROTEINS	48	12g 58.5%	0g 3.3%	0g 38.2%	✕
	Select Food	0	0g	0g	0g	ADD
	Total:	123	18g	1g	5g	
	Actual Nutrition Intake:		58.5%	3.3%	38.2%	

ADD THIS MEAL AND CREATE NEXT

In this example, adding egg whites to a whole egg increases the protein content, and decreases the fat content.

Next, put in other foods that might be needed to create an entree. In this case, we're creating an veggie omelette or scramble, so to complete it, we'll use a couple teaspoons of olive oil for cooking.

Step 2: Add foods needed for cooking

Create New Meal						Load Meal From Favorites
#	Food	Calories	Protein	Carbs	Fat	
1	Large Whole Egg(s) PROTEINS	75	6g 32%	1g 5.33%	5g 62.67%	
3	Large Egg White(s) PROTEINS	48	12g 58.5%	0g 3.3%	0g 38.2%	
2	tsp, Olive Oil FATS	90	0g 33.8%	0g 1.9%	10g 64.3%	
	Select Food	0	0g	0g	0g	ADD
	Total:	213	18g	1g	15g	
	Actual Nutrition Intake:		33,8%	1.9%	64.3%	

ADD THIS MEAL AND CREATE NEXT

Along with some veggies:

Create New Meal						Load Meal From Favorites
#	Food	Calories	Protein	Carbs	Fat	
1	Large Whole Egg(s) PROTEINS	75	6g 32%	1g 5.33%	5g 62.67%	
3	Large Egg White(s) PROTEINS	48	12g 58.5%	0g 3.3%	0g 38.2%	
2	tsp, Olive Oil FATS	90	0g 33.8%	0g 1.9%	10g 64.3%	
0.5	cup, Bell Pepper (raw) VEGETABLES (fiber)	20	0.5g 31.8%	4.5g 9.4%	0g 58.8%	
	Select Food	0	0g	0g	0g	ADD
	Total:	233	18.5g	5.5g	15g	
	Actual Nutrition Intake:		33,8%	1.9%	64.3%	

ADD THIS MEAL AND CREATE NEXT

We'll need to start adding some carbs, so to complete the entree, we can fold it into a 100% whole wheat flour tortilla and top w/some salsa.

Step 3: Add foods to complete the entree.

Create New Meal **Load Meal From Favorites**

#	Food	Calories	Protein	Carbs	Fat	
1	Large Whole Egg(s) PROTEINS	75	6g 32%	1g 5.33%	5g 62.67%	
3	Large Egg White(s) PROTEINS	48	12g 58.5%	0g 3.3%	0g 38.2%	
2	tsp, Olive Oil FATS	90	0g 33.8%	0g 1.9%	10g 64.3%	
0.5	cup, Bell Pepper (raw) VEGETABLES (fiber)	20	0.5g 31.8%	4.5g 9.4%	0g 58.8%	
2	tbsp, Salsa CONDIMENTS	8	0g 30.7%	2g 12.4%	0g 56.9%	
1	100% Whole Wheat Flour Tortilla CARBOHYDRATES	185	5g 22.1%	30g 35.2%	5g 42.7%	
	Select Food	0	0g	0g	0g	ADD
	Total:	426	23.5g	37.5g	20g	
	Actual Nutrition Intake:		33.8%	1.9%	64.3%	

ADD THIS MEAL AND CREATE NEXT

At this point, you consider what you have, and what you might need to complete the meal. In this particular example, the fat quota has been met, but we still need a little more protein and carbs. Some nonfat milk and a serving of fruit will do the trick:

Step 4: Add foods as needed to complete the meal.

Create New Meal						Load Meal From Favorites
#	Food	Calories	Protein	Carbs	Fat	
1	Large Whole Egg(s) PROTEINS	75	6g 32%	1g 5.33%	5g 62.67%	
3	Large Egg White(s) PROTEINS	48	12g 58.5%	0g 3.3%	0g 38.2%	
2	tsp, Olive Oil FATS	90	0g 33.8%	0g 1.9%	10g 64.3%	
0.5	cup, Bell Pepper (raw) VEGETABLES (fiber)	20	0.5g 31.8%	4.5g 9.4%	0g 58.8%	
2	tbsp, Salsa CONDIMENTS	8	0g 30.7%	2g 12.4%	0g 56.9%	
1	100% Whole Wheat Flour Tortilla CARBOHYDRATES	185	5g 22.1%	30g 35.2%	5g 42.7%	
10	oz, Milk (skim) LIQUIDS	100	10g 25.5%	15g 39.9%	0g 34.6%	
1	cup, Pineapple FRUIT	84	1g 22.6%	20g 47.5%	0g 29.9%	
	Select Food	0	0g	0g	0g	ADD
	Total:	610	34.5g	72.5g	20g	
	Actual Nutrition Intake:		22.6%	47.5%	29.9%	

ADD THIS MEAL AND CREATE NEXT

We were aiming for 606 calories, 33.3 g protein, 72.7 g carbs and 20.2 g fat. We ended up with 610 calories, 34.5 g protein, 72.5 g carbs and 20 g fat. This is about as dead-on as it's possible to get.

Is it necessary to get within 5 -10 calories, or a gram or two of your macronutrient targets? No: this is just an example and is meant to demonstrate that it can be done, using reasonable portions of food (not 0.761 tablespoons of flax oil or 0.469 cups of oatmeal) within the context of normal meals. There's some room for error.

It will take a bit of practice to get it right. That's ok: the idea is to think ahead about what you're eating to ensure that you provide your body with a relatively steady supply of critical nutrients throughout the day, without eating too much or too little at any one meal. It's precisely this ability to "try on" different foods and amounts in advance that makes the Diet Planner so useful.

The Diet Planner can also be used to track the changes in your body com-

position. There is a text area for typing detailed notes at the bottom of each page in the planner, as well as text fields you can use to enter data on your weight and body fat percentage. As you gain (or lose), the Planner will plot a graph of the changes in your weight and lean body mass over time.

One of the most valuable features of the Diet Planner is the ability to customize it with your own foods and recipes. Rather than force you to search through thousands of different foods, you can add your favorites to the list of basic foods already there.

To enter your own foods into the Planner, you need to know the grams of protein, carbs, and fat in a serving of the food. One of the best places to find this information is also available to you in the Members' Area: the Food Database.

Using the Food Database

When you open the Food Database, the first thing you see is the search screen, part of which is reproduced in Fig. 8 on the next page.

The Food Database contains information on over 50,000 different foods. In addition to basic food items, there is also an extensive list of commercial packaged products and menu items from popular restaurant chains. You can search by product categories, or by typing a food item into the search box and clicking "Go". The full list of categories includes:

- Fast Food Restaurants, Eating Out
- Frozen & Packaged Meals & Pizzas, Tofu
- Alcohol (Beer, Wine, Spirits, Cocktails)
- Cakes, Muffins, Pastries, Pies, Baking
- Drinks (Sports, Energy & Meal Shakes, Soda, Coffee, Tea)
- Snacks, Popcorn, Potato Chips, Granola Bars, Sports Bars
- Cream, Fats, Oils, Cheese, Dips, Spreads
- Breakfast Cereals, Grains, Rice, Spaghetti
- Soups, Sauces, Dressings, Condiments
- Candy, Chocolate, Cough Drops
- Eggs, Meats, Sausages, Deli Meats
- Chicken, Turkey, Fish, Shellfish
- Ice Cream, Ices, Frozen Yogurt
- Milk, Soy Drinks, Rice Drinks, Yogurt
- Puddings, Desserts, Jell-O, Pancakes, Waffles

- Nuts, Seeds, Fruits, Vegetables, Juices
- Sugar, Syrups, Jam, Honey, Toppings
- Breads, Bagels, Rolls, Crackers, Cookies

The Food Database may not cover everything, but it comes close!

Figure 1: The top half of the Food Database Search Screen. Foods can be searched by category (hyperlinks to sub-categories shown in blue), or by using the search box.

Search: Go

Fast Foods, Restaurants, Eating Out

- Deli, Sandwiches, Wraps
- Fast-Food Chains & Restaurants
- Restaurant & International Foods

Alcohol (Beer, Wine, Spirits, Cocktails)

- Beer, Ale
- Cider, Wine
- Liqueurs
- Liquors, Coolers, Cocktails

Drinks (Sports, Energy & Meal Shakes, Soda, Coffee, Tea)

- Coffee, Hot Chocolate, Cocoa
- Frozen Carbonated Beverages
- Nutrition, Energy Shakes & Drinks
- Soft Drinks, Soda
- Tea & Iced Tea

Cream, Fats, Oils, Cheese, Dips, Spreads

- Cheese
- Cream & Creamers
- Fats, Spreads, Oils, Butter
- Snack & Cheese Dips, Spreads

Frozen & Packaged Meals & Pizzas, Tofu

- Canned & Packaged Meals
- Frozen Entrees & Meals
- Soy & Tofu
- Vegetarian Foods

Cakes, Muffins, Pastries, Pies, Baking

- Cake, Cookie & Dessert Mixes
- Cakes, Pastries, Croissants
- Donuts
- Frostings, Baking Ingredients
- Muffins, Sweet Rolls
- Pies & Tarts

Snacks, Popcorn, Potato Chips, Granola Bars, Sports Bars

- Breakfast Bars
- Granola, Sport & Diet Bars
- Popcorn
- Potato Chips, Pretzels, Tortilla Chips
- Snacks, Trail Mix, Jerky

Breakfast Cereals, Grains, Rice, Spaghetti

- Breakfast Cereal

So, for example, if you went to a restaurant and ordered the lobster, you could use the Food Database to get the info you need to add it to your diet in the Diet Planner. You could either search the category "Shellfish - Fresh, Frozen & Canned" (not shown), or type "lobster" directly into the search box. The information returned by the database is summarized in Fig. 9

Figure 2: The nutrition information returned for "Lobster, Northern, cooked, moist heat." The calories and nutrients for a 6 oz. portion were calculated by selecting "oz" from the drop down box, and entering "6" in the number field.

Nutrition Facts

6 oz

Calories 167	(Kilojoules 698)	
		% Daily Value
Total Fat	1 g	2%
Saturated Fat	0.2 g	1%
Cholesterol	123 mg	41%
Sodium	648 mg	27%
Total Carbohydrates	2.2 g	1%
Dietary Fiber	0 g	0%
Sugars	0 g	
Protein	34.9 g	
Calcium	103.9 mg	
Potassium	599.8 mg	

Note: a dash indicates no data is available

The nutrition information returned by the Database can be scaled to any desired portion size by selecting the units from the drop down box, and entering a number into the adjacent field.

The ability to scale portion sizes also makes the Database a handy tool for determining the total calories and macronutrients in your favorite recipes. Add the macronutrient totals for a standard portion into the Diet Planner and you're set.

The bottom line: using both the Food Database and the Diet Planner make the processes of planning and tracking your diet much simpler. And for my money, anything that makes life simpler is a good deal!

To open the Diet Planner:

Click Here

To open the Food Database:

Click Here

To make life even simpler: my moderators and I created a series of model diets for 1500 - 6000 calories/day using the Diet Planner. These have been transferred to Excel spreadsheets that you can download and use as templates for creating your own diet plan.

To go to the Sample Diet download page:

Click Here

Resources

Return to T.O.C.

It's great to have a list of foods to shop for, and basic equipment to buy for your kitchen. But if you don't know what to make, or can't boil water, you might need some extra help. The following resources can help you out:

- The recipe section in the BBR Members' Area. There are a bunch of great recipes there, with instructions and full nutritional breakdown.

  To check out the recipe section:

  Click Here

- The free e-book, "Tasty Fat Loss and Muscle Building Recipes" is also available to all BBR members on the download page in the Members' Area.

  To download "Tasty Fat Loss and Muscle Building Recipes":

  Click Here

- "Gourmet Nutrition" by John Berardi and John Williams is loaded with great muscle-building recipes and sound nutritional advice. It's available as an e-book from John's site.

  To purchase a copy of "Gourmet Nutrition":

  Click Here

Chapter 4: Completing the Picture

Working SMARTer, Not Harder

Return to T.O.C.

As we've seen so far, the BBR Members' Area contains a number of tools like the Diet Planner, et al, that you can use to help you achieve your goals. So it's time to step back and ask a critical question: just what are your goals?

Yes, I know the answer's blindingly obvious: "to add LBM." It's what this whole book is about, after all. If it wasn't what you wanted to do, you wouldn't be reading these words. D'oh!

All right: how much LBM? What time frame? And is gaining LBM all you want to do - or do you also have some performance goals in mind? Do you want to increase your bench? Your deadlift? By how much? And for how many reps? And what about your body comp? Do you have some fat to lose? Do you want to compete, or even just look good at the beach?

It's not enough to simply want to add LBM or get stronger. To make optimal progress, it will help you to think about what you want from the BBR program in more detail. The more specific you are about your goals, the more likely you are to achieve them.

Let me use an analogy: if you were planning to start your own business, your goal wouldn't be "to make money." You'd have a specific amount in mind: one that was enough to cover your expenses and provide you with an income sufficient to justify the effort involved. You'd create a business plan, and break down your larger goals into smaller, measurable units in order to evaluate your progress. And you'd update your plans on the basis of your results.

I think you can see where I'm headed with this...

The business model is an appropriate one, I think. When you start your own business, it's because you have a vision of yourself as something more than the average working Joe - who puts in long hours for the benefit of someone else's bottom line. You're working for yourself - so you make concise, detailed plans to get the most out of the time/effort involved.

It's the same thing with straightening out your diet and putting in time at the gym: you're working for yourself. You can't go about it in a half-hearted,

"...if you were planning to start your own business, your goal wouldn't be 'to make money.' You'd have a specific amount in mind: one that was enough to cover your expenses and provide you with an income sufficient to justify the effort involved. You'd create a business plan, and break down your larger goals into smaller, measurable units in order to evaluate your progress."

unfocused way and expect to have optimal results.

To push the analogy a little harder, I like to use an old, time-tested business paradigm that perfectly describes the process of setting goals. It's known as the SMART Method. Your goals are "SMART" if they're:

- ***Specific:*** "I want to add LBM and lose fat" is not specific - it's a wish. On the other hand, "I want to add 15 lb. of LBM and cut to 10% body fat" is specific. It gives you a definition of success that you can use to assess your efforts.

- ***Measurable:*** This one's a no-brainer. A lot of people join BBR to "get fit" or "improve my health." Great...but you can't measure "fitness" or "health" directly. How will you know that your efforts are succeeding as well as they could be? Specific goals are measurable by definition. You know your strength or fitness is improving if you increase the poundage you can lift, or decrease the time it takes for you to run two miles. You'll know your health is improving if your cholesterol levels and blood pressure improve, and your insulin sensitivity increases. Progress needs to be measurable. And your measurements will provide you with the kind of feedback you need to make adjustments as you proceed with your program.

- ***Achievable:*** Needless to state, your plans need to be based on the knowledge, skills, tools and other resources that are available to you. There can't be any pieces missing or out of reach. If there are, then you need to be able to compensate, or find a way to work around them.

- ***Realistic:*** Your goals need to be rooted in reality. If you're six feet tall and weigh 135 lb., it's ok to dream about being the next Mr. Olympia, but that's a goal that's completely at odds with where you're at right now.

- ***Time-related:*** Having a time frame attached to your goals is important. If you want to gain 15 lb. of LBM, it matters in terms of evaluating your progress, whether you want to gain it in the next 3 months, or "whenever." In the first case, if you find you haven't gained at least a couple of pounds after the first 2 weeks, then you know it's time to increase your calories, and perhaps make some other adjustments. If your goals are open-ended, however, you may end up waiting considerably longer before you make the needed changes to get on track.

As you consider the above, it should be obvious that any larger goal can be

broken up into smaller, short term goals. For example, if your larger goal is to be 10% body fat, then part of the plan you develop to achieve it would involve a cutting phase. The larger goal of losing excess body fat can be subdivided into a series of shorter-term goals, such as losing 1 1/2 - 2 lb. each week. Other short-term goals might be to eat under 2,500 calories/day; to increase from 3 to 5 cardio sessions each week; or to get to bed by 10 p.m. each night to make sure you're getting adequate sleep.

"The most effective goals are the ones you put in writing. Having a written list is a powerful tool for organizing your thinking and planning.."

The most effective goals are the ones you put in writing. Having a written list is a powerful tool for organizing your thinking and planning. A list also serves as a visual reinforcer: it's a way to "keep your eyes on the prize." Having a checklist of specific action items posted in an obvious place is also another useful strategy. Taping a checklist to the door of your fridge not only works as a reminder, its also measures your success in meeting daily/weekly goals.

Your list of goals might look something like this:

Long Term Goal: gain 20 lb. of LBM in 4 months.

Monthly Goal: gain 5 lb. LBM

Weekly Goals/Activities:
1. Perform 2 x 20 min HIIT sessions/week
2. Train 4x/week (upper/lower split)
3. Plan menus/shopping for following week
4. Cook bulk meats, recipes for the coming week. Freeze/refrigerate single-serving portions
5. Take measurements (Sat. a.m.) and record in Diet Planner.

Daily Goals/Activities:
1. Eat 4,000 kcal/day; 200 g protein, 500 g carbs, 133 g fat
2. Eat 6 meals/day: approx. 33 g protein, 83 g carbs, 22 g fat
3. Take the following supplements: 4 tbsp. Udo's Choice; 9 LEF mix tabs; 5 g creatine monohydrate; 3 caps ZMA (bedtime); 2 g L-tyrosine (pre-workout)
4. Warm-up and stretch for 20 minutes before working out.
5. Prep and store veggies for next day.

Your list will be somewhat different, but you get the point: put your goals and plans in writing and make them as SMART as possible.

Tracking Your Progress

Return to T.O.C.

Making periodic assessments of your progress is an implicit part of setting goals: it's the "M" - or "measurable" part of being "SMART". Evaluating your results on a regular basis provides you with critical feedback on your planning. Keeping your lists of goals and action items around will tell you how well you're sticking with your plan, but only your measurements can tell you how well it's working.

The assessment process doesn't need to be elaborate. At the minimum, you need to have some objective measurements: your weight, body composition, and strength.

- ***Weight:*** Weighing yourself once per week is sufficient - it's not necessary to hop on and off the scale every morning. Bear in mind that fluctuations in weight of +/- 2 to 3 lb. are extremely common, so it's important not to panic if - all of a sudden - it looks like you've "lost" a pound or two at a particular time point. Give it a week or two to see if it's actually a trend, or simply a temporary shift in your total body water.

- ***Body composition:*** Measuring your body fat percentage will give you important information on your gains: you may be gaining weight at a steady pace, but if too much of that weight is fat, then some adjustments are in order.

  How to measure your body fat is covered in the next section.

- ***Strength:*** Your training logs will give you detailed feedback on your progress in the gym during specific training phases. This is discussed in more detail in Chapter 6.

Other useful measurements are:

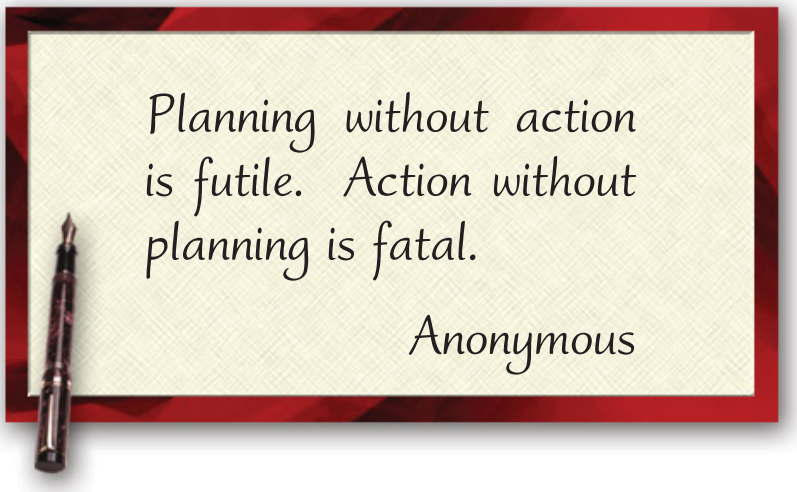
- ***Tape Measure:*** used to measure the girth of specific body areas, such as waist, chest, thighs, upper arms.

- ***Mirror:*** this one is obvious. Many people want to improve their appearance as well as their strength/power - so how you look in your skin is an important measure of progress.

- ***How you feel:*** While this may be subjective, it's also extremely important. How you feel can tip you off to something amiss in your diet, training, or lifestyle. Constant soreness, difficulty with sleeping, moodiness/irritability, fatigue, hitting a plateau in the gym and/or suffering a decline in your libido could mean you're overtraining, or not paying sufficient attention to recovery.

  Your lifestyle can have a significant impact on your recovery, even if you're doing all the right things w/regard to diet, pre-/post-workout nutrition, and training. Certain things, like job stress and working hours, are difficult to change. Partying 'till 3 a.m. 4 or 5 nights a week is a different story. But to the extent that you can, arranging your lifestyle - at least temporarily - to support your training can make a big difference in your results.

"How you feel can tip you off to something amiss in your diet, training or lifestyle. Constant soreness, difficulty with sleeping, moodiness/irritability, fatigue, hitting a plateau in the gym and/or suffering a decline in your libido could mean you're overtraining, or not paying sufficient attention to recovery."



Measuring Your Body Composition

Return to T.O.C.

Whether you're bulking or cutting, you should have a reliable method for estimating your body fat percentage. As you gain - or lose - weight your body fat percentage will tell you what the change means.

There are a variety of techniques that can be used that vary in time, expense, and accuracy/precision. The pros and cons of each are outlined below.

DEXA: "DEXA" stands for Dual Energy X-Ray Absorptiometry. As the name implies, low level X-rays at two different energy levels are used to determine body composition. DEXA scans can differentiate between soft body tissues and bone - which makes it especially valuable for providing estimates of bone mineral density.

Pros: DEXA scans are:

- highly accurate. DEXA is considered to be the "gold standard" for body fat measurement.
- non-invasive. All you need to do is lie on the table and hold still.
- requires no special preparations. There is no need to fast prior to the test, or restrict activity, medications, etc.
- radiation exposure is low. The amount of radiation used for body comp testing is equivalent to a single day's worth of normal background radiation.

Cons: DEXA scans are:

- expensive. The prices vary by facility, but I've seen some programs that charge around $70 - $150.
- inconvenient. DEXA units are typically housed in hospital, university, and other clinical/research settings. They aren't freely accessible to the public - you need to be referred by a healthcare provider, enrolled in a research study, or participating in an outpatient hospital or clinic pro-

gram to access the service.

A DEXA scan - if you can get one - is best used as an occasional check to verify your own body comp estimates.

Hydrostatic (Underwater) Weighing: Hydrostatic weighing is another highly accurate method for assessing body fat percentage. The test actually measures total body density. Since the density of fat is less than lean mass (fat floats!), the contribution of fat and lean tissues to your total body density can be determined mathematically.

Pros: hydrostatic weighing is:

- accurate. Hydrostatic weighing was considered the method of choice for body composition testing prior to the development of more high-tech methods.

- less expensive than DEXA. The typical cost of a test runs around $25 - $50 (US).

Cons: hydrostatic weighing is:

- inconvenient. Since immersion is required, the test is limited to facilities that provide a "dunk tank." Although some larger, more expensive private health clubs and facilities now offer this service, your best bet is to go to a local university athletic department.

- complicated. Prior preparation is required: you cannot eat or exercise within 3 hours of the test. A swim suit and towel are also needed. Residual lung volume also needs to be measured to correct for the error that inhaled air can introduce into the assessment.

Air Displacement Plethysmography: This is popularly known as "Bod Pod" testing. The Bod Pod measures total body density, similarly to hydrostatic weighing. The difference is that the air displacement, rather than water, is used. Bod Pod units are sold commercially, and can be found in a variety of settings.

Pros: The Bod Pod is:

- fairly accurate. Clinical studies have shown that Bod Pod results are

comparable to hydrostatic weighing, although in practice, discrepancies have been noted.

- convenient: Bod Pod measurement is similar in accessibility and price to hydrostatic weighing, but considerably less time consuming and complex.

Cons: The Bod Pod is:

- less accurate than hydrostatic weighing for certain populations and conditions.

Bioelectrical Impedance Analysis (BIA): BIA assessments of body composition actually measure the resistance to a low, safe electical current passed through the body. Electricity is conducted more readily through body water contained in muscle and other lean tissues than it does through fat. More sophisticated, research grade BIA devices rely on hand and foot electrodes, whereas home-use devices (scales and hand held instruments) rely on foot-to-foot or hand-to-hand circuits.

Pros: BIA measurements are:

- simple and fast. BIA devices are often used in commercial gyms and clinic settings for this reason.

- relatively inexpensive. Home devices cost about $50 - $200. The more expensive home units generally offer multiple test modes, such as "athlete."

Cons: BIA measurements are:

- imprecise. Total body water fluctuates throughout the day. The most accurate readings are made using clinical instruments and subjects who adhere to the pre-test protocol (no eating/drinking for several hours before the test; no exercise, caffeine, or alcohol 24 hours before the test).

  Needless to state, it is very difficult to standardize testing conditions with a device designed for frequent home use. Home measurements often vary 3 - 4% over the course of a single day.

- inaccurate. Specific equations are used to convert the measurement to

a body fat percentage. These equations are developed and validated on populations: individual results may vary, depending on how well you fit the population average the equation was developed for.

Near Infrared Interactance (Futrex): NIR measurement is based on the concept that organic materials absorb light in different areas of the spectrum. NIR devices utilize infrared light emitted at specific frequencies, and measure the difference between the amount of light that's absorbed vs. the amount that's reflected.

A commercial version of NIR made by Futrex is available in many gyms and clinics. A single measurement is made at the midpoint of the dominant bicep. The instrument calculates body fat based on the absorption of infrared light at 938 nm and 948 nm.

Pros: Futrex devices are:

- fast. The measurement can be made in a few moments.
- inexpensive. Gyms and clinics using these types of devices typically charge less than $10 for the service - it may even be free as a part of a membership or other screening/evaluation.

Cons: Futrex devices are:

- not considered as accurate as other methods, particularly for those with higher (> 30%) or lower (< 8%) amounts of body fat.

Skinfold testing: This is the most widely used method for estimating body fat percentage. Calipers are used to measure the thickness of skinfolds taken at specific areas of the body. The more body fat you have, the thicker the skinfold will be due to subcutaneous fat deposits. Standardized equations are used to estimate your percentage of body fat.

Pros: Skinfold testing is:

- convenient. There is no prior preparation involved, and testing is available in a variety of settings. In addition, reasonably reliable tools are available for home use.
- inexpensive.

- reasonably accurate/precise. In the hands of an experienced tester, the estimates of body fat percentage can be both realistic and reproducible.

Cons: Skinfold testing is:

- variable. The results are dependent on the equations used. There are a wide variety of equations developed for different populations. Your results will vary depending on which equation is used. So it may be difficult to compare results obtained from one set of skinfolds/equation with another.

- prone to error. People testing themselves often underestimate their body fat by pinching too hard. It is also difficult to get reproducible results at first - it takes practice.

With all its faults, however, skinfold testing is probably the best bet for people wishing to measure their body fat at home.

The Accumeasure

If you're unfamiliar with testing your own body fat %, one of the simplest instruments to use is the Accumeasure. I've found these inexpensive calipers to be pretty reliable under a variety of circumstances.

The testing procedure recommended by the manufacture is to measure a single skinfold. The skinfold thickness is compared to a chart. All you need to do is to find the correct number for your age and measurement and you're done. It's about as simple as it's possible to get.

This method is fairly accurate for average people, but may be misleading for leaner people, or people with stubborn fat deposits in different areas of their bodies.

No need to give up on the Accumeasure though - it's still a tool we can use. We need to measure multiple skin folds, however, in order to get a more accurate picture.

The two most common methods for calculating body fat percentages in athletes are the three and seven site measurements and calculations worked out by Jackson and Pollock.

For three site calculations, the following skin folds are used:

Men: pectoral, abdomen, quadriceps
Women: triceps, suprailiac, quadriceps

For seven site calculations, the following skin folds are used:

Men and women: triceps, pectoral, midaxillary, subscapular, suprailiac, abdominal, quadriceps

Some guidelines for taking measurements:

- Measurements should be made on the right side of the body.
- Have a partner assist you with more difficult skin folds.
- Pinch the skin fold firmly between the thumb and forefinger.
- Apply the calipers about 1 – 2 centimeters away from the thumb and finger holding the skin. Place them perpendicular to the skin fold and halfway between the crest (top) and the base of the fold.
- Take the reading when you hear the Accumeasure click into place. Maintain the pinch until you've finished taking the measurement.
- Take 2 - 3 measurements at each site, and average them for your body fat calculation.
- Rotate through measurement sites in order to allow the skin to return to normal before repeating the measurement.

You'll need to use some rather complicated looking equations to calculate your body fat percentage (D = body density):

Skinfolds:

PEC = Pectoral
AB = Abdominal
QUAD = Quadriceps
MID = Midaxillary
TRI = Triceps
SUB = Subscapular
SUP = Suprailiac

Men (3-site):

SUM = PEC + AB + QUAD

D = 1.10938 - (0.0008267 x SUM) + (0.0000016 x SUM^2) - (0.0002574 x age)

Men (7-site):

SUM = TRI + PEC + MID + SUB + SUP + AB + QUAD

D = 1.112 – (0.00043499 x SUM) + (0.00000055 x SUM^2) – (0.00028826 x age)

% BF = (457/D) – 414.2

Women (3-site):

SUM = TRI + SUP + PEC

D = 1.0994921 - (0.0009929 x SUM) + (0.0000023 x SUM^2) - (0.0001392 x age)

Women (7-site):

SUM = TRI + PEC + MID + SUB + SUP + AB + QUAD

D = 1.097 – (0.00046971 x SUM) + (0.00000056 x SUM^2) – (0.00012828 x age)

% BF = (457/D) – 414.2

It will take some time to learn to make measurements that are reliable and precise. You (and/or your partner) will need to work on it until you can make reproducible measurements for each skin fold site. It might seem awkward at first, but practice makes perfect!

To discuss Body Fat testing further, you can post in the Members' Area.

Click Here

The BBR Forum

Return to T.O.C.

This book is your gateway to one of the biggest assets that you can draw on for helping to set and meet your goals: support from like-minded people. For all the information here, I can't possibly anticipate and write down a solution to every problem that you might encounter. I created the BBR forum to do that. Using the forum, you can draw on the collective wisdom and experience of other successful members, whether it's on some specific detail in your program, or whether you simply need some motivation to keep going. You can learn a lot from other members who are willing to share what they've learned and follow the examples they've set.

> On July 5, 2001, I started my 'new life' of proper diet and exercise. I was a weak, skinny, fat guy - 205 pounds, 25% bf and everything but my belly skinny. Case in point - 11" arms.....flexed. My big 3 lifts were barely squatting 95 pounds, bench press of 4 reps at 135 pounds, didn't deadlift at all.
>
> Since then, sticking to it very religiously, I'm now at 245 pounds and 17.5% bf. My big 3 lifts (1 rm) are 300# bench (with a shoulder that hates benching), 400 pound atf squat and a 500 pound deadlift. I've put 10" on my shoulders, 7" on my arms, 7" on my quads.
>
> BBR Member *"rbtrout"*

> I continue to set new PB's with this type of training. My strength is soaring right now after a long period of being stuck. My size is also increasing. I am now 250# and have been here before but this time it is a different weight. More lean muscle.
>
> I bench on Saturdays, this is my favorite day for it and have set new PB's for the last 3 weeks. New one again today. Thanks for the info on this training.
>
> BBR Member *"plague"*

Many BBR Members who post on the forum have learned how to use goal setting to stay motivated and develop a habit of success.

I've had many friends who don't work out make remarks like "I know I have to get to the gym, but…" They seem to view working out as a burdensome chore like cleaning out kitty litter. I can't help but believe that people with the wrong mental outlook may never get optimum results no matter how much they work out. Plus, there seems to be a mindset amongst the general public that working out is impossibly difficult and painful, which is abetted by the advertising industry. Many of us have probably seen infomercials on TV where a bunch of chubby folks sit in a kumbaya circle waxing poetic about some wonder pill or diet, quite proud of the fact that they've never been in a gym, or never even having driven by one (however, I do like the way one of the Bowflex commercials puts it: "We've all heard about the guy who eats sandwiches, but you never see him at the beach with his shirt off .").

To help keep my head in the right place, I've found it very helpful to set short term goals.

Before a workout, I may decide to:

1. Complete one more set of a given exercise.
2. Add a rep or two to a given set.
3. Pyramid up 10 pounds when I previously could only do 5.
4. And so on…

The trick is to make the goals challenging, but not unreasonable. They also must be met, the only excuse not to being dropping something heavy on your head (and sometimes not even then…).

BBR Member *"tbabineaux"*

Each small goal achieved contributes to larger ones. In time, what seemed to be impossible becomes reality. Using the forum for both technical - and moral - support will help you get to where you want to be, be it bigger, leaner, stronger - or all three!

Perhaps the most important thing about BBR is the community. This is a very positive place. There are other sites that have more of a, shall we say, "locker room" atmosphere. This is not one of them. I took a chance and posted pictures of my progress so far and have received nothing but encouragement and support. I can not begin to tell you how helpful that has been....I really, really value this forum. I do not remember what it cost, but it has paid dividends many times over.

Thanks to all of you for the support.

BBR Member *"Pedestrium"*

Peter, it sounds like you have come a long way in this journey. You should be proud. From the sound of it, you are taking a methodical and logical approach to your goals, and that's exactly what we stress on BBR and/or FLR. I am thrilled we have played an important role in your transformation and it's stories like this that keep me motivated also. Bloody good work!

BBR Author *"WillBrink"*

...The facts are that ANYBODY can do what you did, if they have the things you stated. So many hit a wall and give up because they have been "programmed" that they are unhealthy and overweight...

Thanks for having the uhm....b@lls to post your progress! that is HUGE to many people!

BBR Member *"Tom40"*

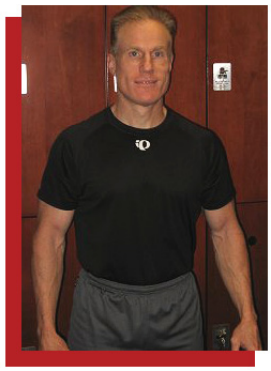
Man what an inspiration you are!!!

I was much in need of a boost and you provided it. I'm happy for you and anyone who can change their life in such a positive way. ...

BBR Member *"Christopher B"*

BBR Member Profile: Kevin Little

Return to T.O.C.



I did not start lifting until I went to college, and gained almost 30 pounds the first year. I was hooked! It was the year 2000 that I turned my efforts to 100% bodybuilding. I never thought I would get up on stage in less than my underwear, but finally did in June 2002 and have since been bitten by the competition bug. I looked at an uncountable number of articles and forums and then stumbled onto BBR back in May of 2003. The wealth of info available on the BBR web site and e-book is second to none though. I have found a handful of trusted and respected resources and I can honestly say that BBR is at the top of the list. The sharing of info and the camaraderie on this site is truly amazing and I feel lucky to just be a part of it.

Eating: For diet I try and eat relatively clean year round as it is much easier to dial in at contest time. Staying relatively lean year round makes contest prep a lot easier and much more fun. I do have the occasional goodies and a glass of wine or a beer every so often, but really try and keep things in moderation as that is what works for me. My favorite meal is oats, natural peanut butter, a banana, and protein powder mixed with a little water just to make a thick paste. This is really the "staple" in my diet and is easily transportable. It has become a favorite (minus the banana) of my son's as well. I don't really track things very closely all the time – I use the mirror as a judge

"KL"

Height: 5' 8"
Weight: 158 lb.
Age: 43 years
Bodyfat: 8%

Professional: Finance Director

Children: One daughter-Age 13 & one son-Age 9.

Training and diet goals: Add LBM!

Contest goals: Win an overall.

and the "jump and jiggle" test. If I jump in front of the mirror and I am not happy with all the jiggling, then I know it time to buckle down. Believe me it works! I don't track my bodyfat, but use this test as a barometer.

Training: My drive comes from pushing myself as hard as possible both physically and mentally. I have operated this way my whole life and will continue, as I don't want to have any regrets. I strive for continuous improvement and believe in continually challenging myself whether it be in the gym, professionally or personally.

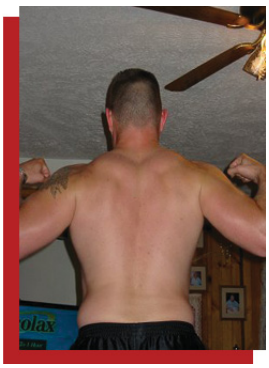
I head to the gym at 3:45 a.m. Monday thru Friday. This way I get the workout in and have no excuses that can build up over the day that would cause me to miss the workout. Also, it gives me time in the evenings to spend it with my kids, or coaching their soccer teams, or doing whatever. In addition, it gives me all day to re-feed the body from the morning workout. I do mix my workouts up a bit, but always try to keep in the big three (squat, bench and dead lift).

Thinking: I believe that in order to be successful, one has to have passion for what they do – in any aspect of life. I also think that one can never become complacent and simply accept the status quo. You should always strive to reach that next level and don't let age be a factor (age is just a number). You should share your knowledge and listen when others are sharing theirs. It is these simple philosophies that drive me to live and enjoy each day to the fullest and work towards continuous improvement.

"I looked at an uncountable number of articles and forums and then stumbled onto BBR back in May of 2003. The wealth of info available on the BBR web site and e-book is second to none though. I have found a handful of trusted and respected resources and I can honestly say that BBR is at the top of the list."

BBR Member Profile: Jason Halstead

Return to T.O.C.



"JHalstead"

Height: 6'1"
Weight: 200 lb.
Age: 31 years
Bodyfat: ~10.5%

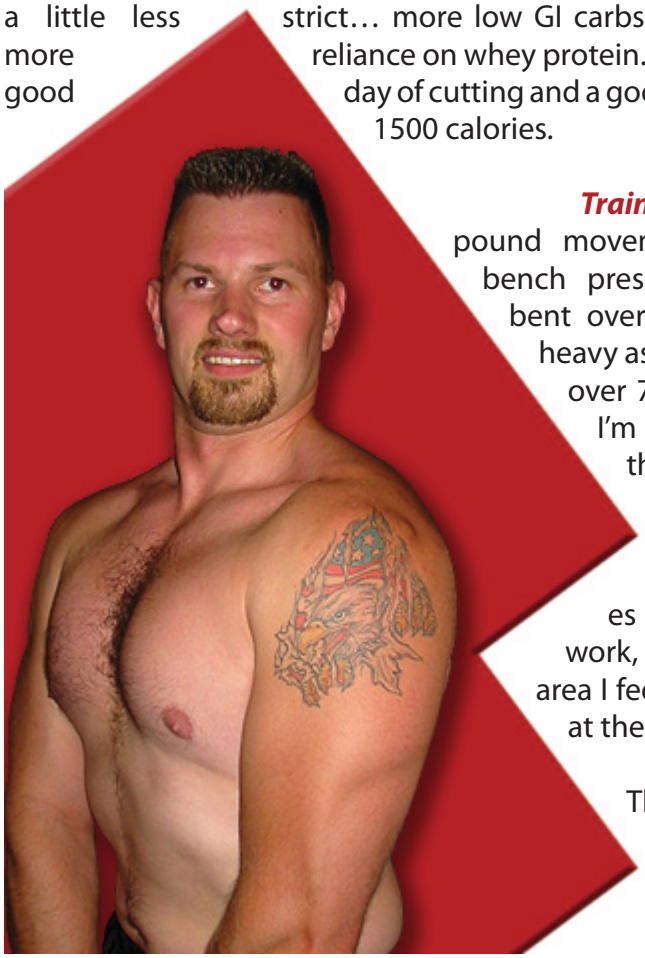
Professional: IT Manager at an automotive supplier (2 locations).

Personal: Married (Dawn), 1 kid (Lexie), 3 cats (Monty, Sebastian, and SQL),

Goals: To get stronger! I'd love to add 90 pounds to each of my lifts and one day bench press 405+, squat 405+, and deadlift 500+.

I was just finally getting around to getting serious about my desire to be healthy and live my lifelong dream of having some good healthy muscles when I found BBR. I have no doubt that finding the e-book and forum when I did saved me a lot of time and money compared to a lot of the crap that is out there.

Eating: My diet varies considerably, depending upon my goals at the time. If I'm cutting I tend towards more real food, lower carbs (gotta keep the veggies and fruit though!), and higher healthy fat content. Bulking means a little less strict… more low GI carbs from oats and such and more reliance on whey protein. The difference between a good day of cutting and a good day of bulking? Around 1500 calories.



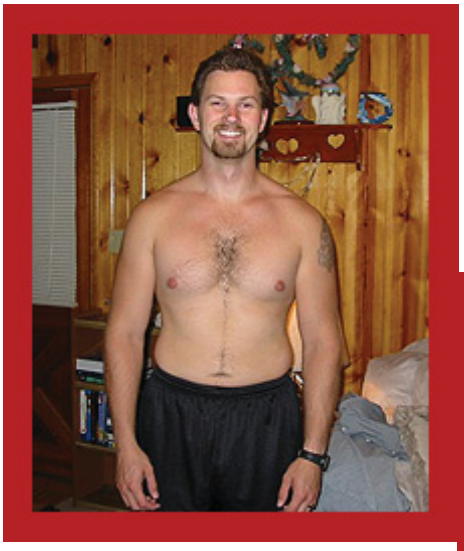
Training: I generally dig compound movements (deadlifts, squats, bench pressed, clean and presses, bent over rows, etc.). I like lifting heavy as well, and very seldom go over 7 or 8 reps in a set unless I'm training abs (I'll go to 12 there). It is not uncommon for me to follow these big lifts up with some post-fatigue isolation exercises as well. Bicep and tricep work, shoulder work, whatever area I feel needs to be focused on at the time.

The routine varies every 3 or 4 weeks as I change things up to keep myself from stagnating. Cutting

cycles also see me engaging in interval training on off days, which is a compound lift staggered with quarter mile runs. My warm is similar: a set of clean and presses followed up with a quarter mile walk at a steep incline followed up by a heavier set of clean and presses.

Thinking: Weight training, for me, requires a lot of dedication and focus. On any normal day I have to deal with my family, work, school, a couple of hobbies, and whatever shiny rock catches my eye. When I am staring up at several plates that are conspiring to crush me, there's no room for any of that distraction. I have to focus 100% to thwart the plot of the evil plates hanging above me. It gives me a reprieve from the rest of my reality and allows me to recharge my mind. That, and the endorphins from a good workout certainly help elevate my mood after a long day at work as well. My wife used to get annoyed that I would take an extra hour out of my day to work out. Now, having seen how much it improves my mood, she is worried when I don't work out!

"I was just finally getting around to getting serious about my desire to be healthy and live my lifelong dream of having some good healthy muscles when I found BBR. I have no doubt that finding the e-book and forum when I did saved me a lot of time and money compared to a lot of the crap that is out there."



Left: Before first bulking phase.

Right: After first bulking phase

BBR Member Profile: Phil Brown

Return to T.O.C.

"phil_b"

Height: 5' 6 1/2"
Weight: 162 lb.
Age: 52 years
Bodyfat: 8%
Location: Cayman Islands

I started weight training at age 12 and it has been a part of my life since then. Most of the years since high school I have worked in the health & fitness industry. I am a self employed private trainer. I am thankful for stumbling upon BBR/FLR which holds an immeasurable treasure of valuable information.

Eating: Being that I am an ectomorph, consuming a lot of whole foods to build and maintain my muscle mass has always been a necessary ingredient in my life and achieving my goals. Shakes and a few supplements also play an important role to make it easier to achieve my daily intake and for my pre and post-workout nutrition.

Training: Since 1987 I have used a 3 day split routine with minimal sets. My workouts take 20 to 40 minutes maximum time to perform whether on a maintenance or building program. My workouts have a main concept foundation with extractions from other theories carefully blended into them.

Thinking: There are several factors that stimulate me to succeed. One is to use myself as a motivational tool to my family and both young and older individuals whom I am exposed to so they can see that their health & fitness dreams are possible. Second is to not allow a motorcycle accident I had in 1975 where the patella ligament of my right leg quad muscles got torn

off of the bone rob me of enjoying life to the fullest of what's possible. The doctors didn't believe I would ever do much with my leg ever again after the surgery. They were wrong, but I confess in this case they were glad to be wrong. Lastly but necessarily last, to not take life for granted and to preserve life as much as possible in order to be there with my family and friends to enjoy the beauty of life together.

"...I plan on using much of the information within BBR to keep building and to prepare for this contest and my future training. BBR and FLR are great e-books, second to none and this forum is fantastic also. I can clearly see the dedication of the staff who runs it and also the devotion of the members to it. GREAT JOB!!!!"

BBR Member Profile: Scott Brouse

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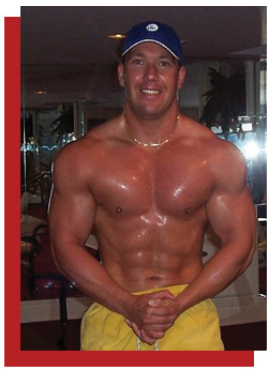
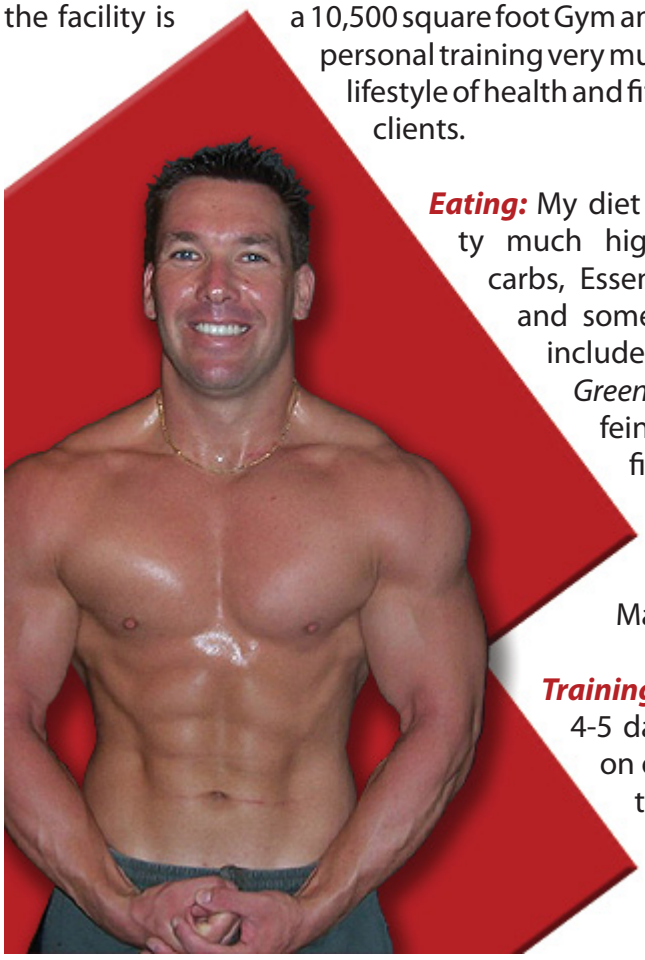


"Scobro"

Height: 5' 8"
Weight: 185 lb.
Age: 35 years
Location: Ontario, Canada

I came across BBR site a few years back and it has been the greatest way to get information on fitness and nutrition. I also was fortunate enough to be put on the top of the website, at one point. The moderators are top notch and the questions are answered very professionally plus the members are very friendly and accommodating in their feedback as well.

I have been training seriously for about the last 7 years I work full time as Manager, Personal Trainer/Nutrition Consultant at The Oakville Innate Centre in Oakville Ontario Canada; the facility is a 10,500 square foot Gym and Wellness centre. I enjoy personal training very much and try to promote the lifestyle of health and fitness on a daily basis to my clients.



Eating: My diet is very strict and is pretty much high protein, whole grain carbs, Essential fats, lots of veggies and some fruits. My supplements include Whey protein isolate, *Greens+*, ephedrine and caffeine, dextrose/maltodextrin, fish oil, evening primrose oil, vitamins/minerals, B-12 complex, ZMA, 5-HTP. I also take the herb Maca.

Training: My training is usually 4-5 days a week concentrating on one or two body parts per training session. I also do 30 min of cardio in the morning and then again after training to promote

fat loss. I vary my exercises and reps depending on my goals. I also throw in some plyometrics now and then for extra conditioning.

Thinking: I am a very spiritual person and I find training really focuses your mind and puts the whole mind/body/soul connection together perfectly.

"This is by far the best, complete and up to date internet fitness/nutrition site there is.

...This site is for anyone serious about fitness and nutrition and want the truth....This is by far hands down the place to come for anyone serious on obtaining the correct information about fitness and nutrition."

BBR Member Profile: Paul Afek, M.D.

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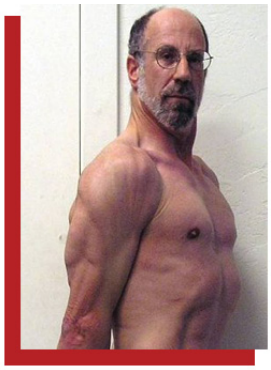


"middl-leagedguy"

Height: 6' 2"
Weight: 210 lb.
Age: 52 years
Bodyfat: 8 - 12%

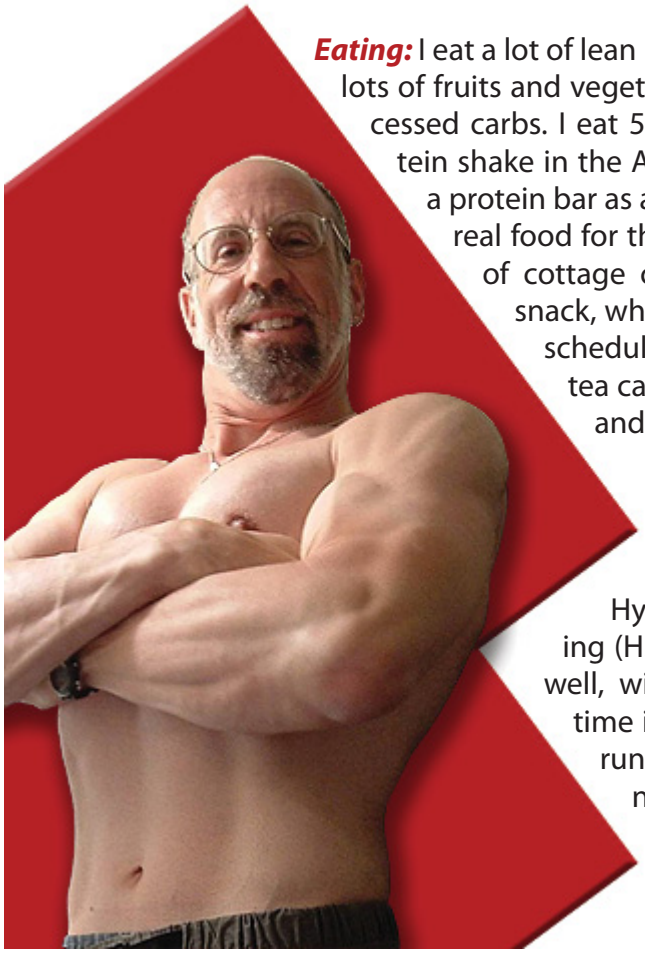
Profession: family physician.

Personal- married to Dina for 22 years, 3 children: Adi - age 19, Liat - age 15, Noam - age 10. We live in the Sonora Cohousing community in Tucson, AZ.

Training goals- mostly survival! but also adding more muscle while staying lean (I enjoy having a six-pack at 52!).

I think that my trying to get more fit probably is a reaction to seeing a lot of overweight and out of shape patients, and all the health problems they have. It certainly is better to tell them of my struggles with the same issues and that they also can overcome them. Advice is always easy to give, if not easy to follow!

I have gotten lots of valuable information from the Bodybuilding Revealed e-book and website. There is so much information and misinformation out there, and BBR takes a rational and reasonable approach to it all.



Eating: I eat a lot of lean protein- chicken and fish, lots of fruits and vegetables, and minimally processed carbs. I eat 5 or 6 meals a day- a protein shake in the AM, and often at bedtime, a protein bar as a mid-morning snack, and real food for the rest. I often have a cup of cottage cheese for my afternoon snack, which I can work into a busy schedule. I take flax oil and green tea capsules, as well as creatine and a multivitamin.

Training: I have done a variety of training methods- I am currently using Hypertrophy Specific Training (HST), which seems to work well, without spending a lot of time in the gym. I do cardio by running on the treadmill, but not very frequently.

Thinking: My motivation has been seeing the

improvements in my body, and the feeling of being more fit in middle age than I was when I was younger. I enjoy going to the gym, and rarely feel like I am forcing myself to work out (even at 5:30 in the morning!). My wife has joined me in working out, so it also is a pleasant shared time together.

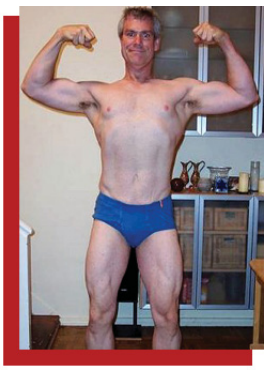
"I have read many books on fitness and nutrition, but BBR has been by far the most informative and accurate...

...The BBR forum has been really excellent with tons of useful information, and moderators who answer quickly and accurately if there are any questions. I am extremely happy that I signed up for the e-book and website."

BBR Member Profile: Peter Eckart

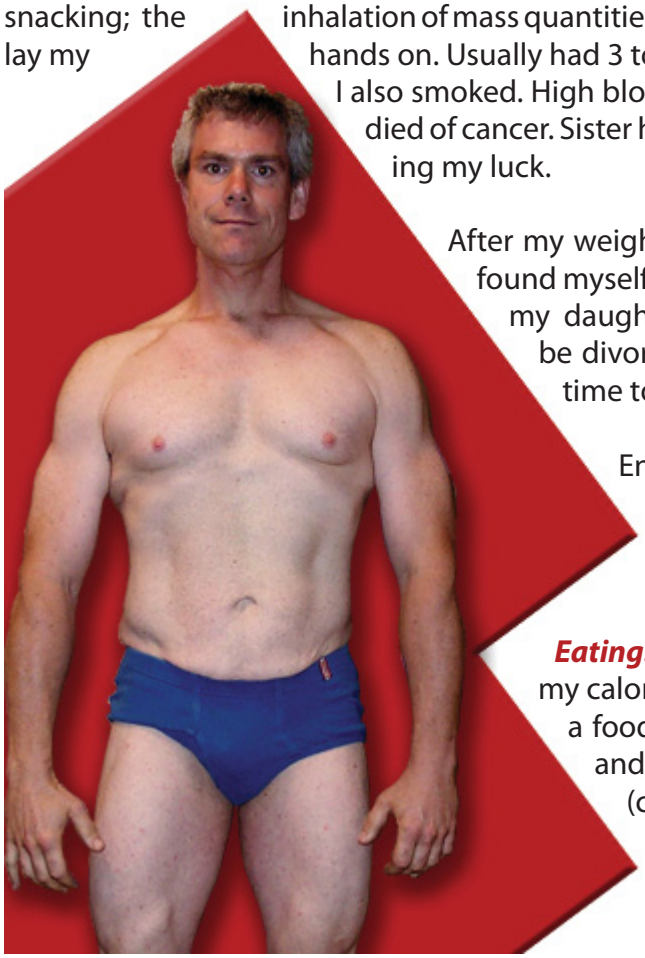
Return to T.O.C.

"Pedestrium"



I love the somewhat scientific bent of the BBR site, i.e. "let's see the research". The straight up info on all of the supplements and ingredients is a real time and money saver...I really, really value this forum. I do not remember what it cost, but it has paid dividends many times over.

I have been heavy all my adolescent and adult life. My "set point" seemed to be around 280. I was tight in size 42 jeans. In retrospect, the biggest mistake was that I NEVER ate breakfast. I would have a late and huge lunch and then a late and huge dinner). Then, you guessed it, late night snacking; the inhalation of mass quantities of ANYTHING that I could lay my hands on. Usually had 3 to 5 hours of sleep a night. I also smoked. High blood pressure. Both parents died of cancer. Sister has diabetes. I know, pushing my luck.



After my weight peaked at 330 lb. and I found myself unable to really play with my daughter and myself about to be divorced, I realized that it was time to "choose life" as they say.

End of Feb, 2006 I joined my local World Gym and now drag my fat ass in almost everyday.

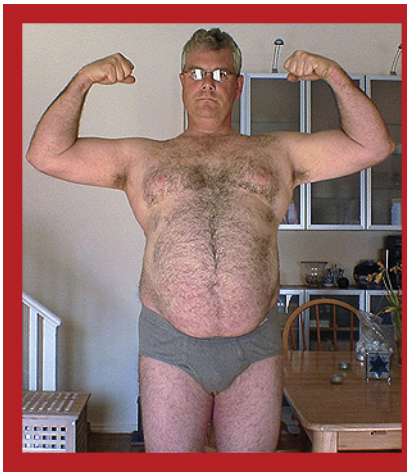
Eating: I figured out my LBM and my caloric requirements. I bought a food scale. I got a body scale and a BF measuring device (calipers came later). I created a food tracking database in Filemaker and religiously recorded EV-

ERYTHING I ate for about two months. For those two months, I averaged 2384 calories a day, 18% fat, 43% carb, and 39% protein. In retrospect, I think that the tracking was really the key. I now have a much greater understanding of nutrition and the nutritional content and density of foods.

Training: My progress the first two months was good, but it really improved with what I learned in the BBR forum. I realized that I was over training and doing too much cardio. When I cut back the volume of both, my results improved. Less was more in this case I also began to follow programs. I did one of the Poliquin routines from the e-book, but honestly, it was too hard for me in the shape I was in. I tried a few others, usually some sort of 3 day split. I did a cycle of EDT and found that to be really a fun kick in the pants. I recommend it to anyone for a change of pace. I am currently trying another routine from the e-book now that I am in better shape.

Thinking: To sum it up:

- You have to be motivated from within and stay positive.
- You have to set goals and measure your progress on a regular basis.
- You have to realize that Nutrition IS IT! It is really the key to make all if this work.
- Then, and only then, comes training.



Left: Before (2/26/06)

Right: After (8/17/06)

"Perhaps the most important thing about BBR is the community. This is a very positive place. There are other sites that have more of a, shall we say, "locker room" atmosphere. This is not one of them. I took a chance and posted pictures of my progress so far and have received nothing but encouragement and support. I can not begin to tell you how helpful that has been."

BBR Member Profile: Elissa Lowe

Return to T.O.C.

Discovering Bodybuilding Revealed was a life-changing experience...I originally bought the e-book for my husband. I never imagined I'd need it - I already had the perfect trainer and thought I was set. But once I started to look around - I was hooked.

I've had a great time modding the BBR and FLR sites. I really enjoy working with Will - I have the utmost respect for his knowledge and experience. He and his business partner Simon (the site administrator and impressario of Internet Publications) have created something unique: a place where people can get top-quality information on diet, training, supplementation, and related topics, for a minimal investment. There are no tricks, no hidden agendas, no sales pitches. Over my years with BBR, I've had the opportunity to watch it grow, and I'm honored to be a part of it.

Eating: When it comes to eating, whole foods and variety rule: I seldom eat the same meals everyday, with the exception of breakfast, which always starts with a hyooge cup of freshly brewed/ground coffee, and either a bowl of oatmeal w/ground flaxseed and whey, or a veggie scramble of some kind. I always keep bags of frozen berries (especially blueberries) around, for a quick smoothie: when I'm focused on my writing, I can easily forget to eat.

Training: My former trainer used to put me through a number of very attention-grabbing exercises. I used to have complete strangers walk up to me and say things like: "it hurts just watching you do that." ROFL!!! I don't mind having an audience, but these days I prefer to keep it simple: 2/3 day splits with a focus

Height: 5' 3 1/2"
Weight: 126 lb.
Age: 49 years
Bodyfat: ~13%

Professional: The "Moderatrix" at BBR/FLR; free-lance researcher and writer.

Personal: Married to husband John for 26 years. 2 kids: Ryan (16) and Nicole (13). Dog "Jake" and cat "Kirby" round out the household.

Training Goals: To add another 5 lb. of LBM, 1" on my biceps and be able see all 6 striations on my abs.

on basic exercises: squats, deads, walking lunges, dumbbell bench presses, dips, barbell rows and curls, dips, chins, etc. I'll play around more with grip, tempo, sequence, reps, sets to keep it interesting and challenging.

Thinking: I'm constantly thinking and planning, which is one reason training appeals: it demands total focus and concentration, so it forces me to take a mental break from my work. No matter what's on my mind when I walk into the gym - it's virtually forgotten by the time I walk out. And the sense of accomplishment makes it all worthwhile: there are very few things you can do where the rewards are commensurate with the work involved.

"I've had a great time modding the BBR and FLR sites. I really enjoy working with Will - I have the utmost respect for his knowledge and experience. He and his business partner Simon (the site administrator and impressario of Internet Publications) have created something unique... Over my years with BBR, I've had the opportunity to watch it grow, and I'm honored to be a part of it."

Chapter 5: Supplements

Brand Name Supplements

Supplements

Brand Name Supplements

Return to T.O.C.

You can find a number of web sites that claim to review bodybuilding supplements, but in reality, they're thinly disguised sales pitches. Honest reviews are few and far between. And I have yet to come across a website, magazine, or book, that reviews very many of the hundreds of supplements available on the market today.

We have over 440 reviews of brand name supplements in the BBR Members' Area.

Search through our 440+ supplement reviews here:

Click Here

That's an amazing number that's unmatched by any other source of information that I've uncovered to date. And even more will be added as time goes by. And the best part about it, is that if you don't see a review for a supplement that you're considering, all you need to do is post a request - my moderators and I will review it for you.

Where else can you get that?

There are literally thousands of bodybuilding supplements on the market from manufacturers and distributors around the world. When I first decided to write this e-book, I knew it would be impossible for me to review specific, brand name supplements. Any reviews I wrote would be rendered useless by changes in ingredients or recommended doses. And with new supplements constantly appearing on the market, this book would be obsolete within months.

That's why I focused on ingredients rather than brand name supplements for this book. The vast majority of OTC supps are formulated from the same, relatively short list of nutrients. By knowing the science behind the claims made for each compound, you can accurately predict whether a supplement containing those compounds will work. I've yet to see a brand name supplement composed of questionable or under-dosed ingredients that truly helped anyone gain muscle or improve performance.

"We have over 440 reviews of brand name supplements in the BBR Members' Area...That's an amazing number that's unmatched by any other source of information that I've uncovered to date."

The information presented in this chapter gives you the power to pick up any product and decide for yourself, whether a particular brand name supplement is worth spending your hard-earned money on.

With this integrated approach, all the bases are covered: reviews of specific brand name supplements AND nutrients/ingredients, using a format that can be constantly updated as new information comes in.

The "Supplement Scoreboard" is a great summary of the information you need to evaluate a product. But if that's not enough, there's backup help on the Members' Area, where my moderators and I can offer additional information and responses to your questions.

Between the e-book and the Members' Area, you have all the information you need on bodybuilding supplements.

Search for a review/post a request for a new review:

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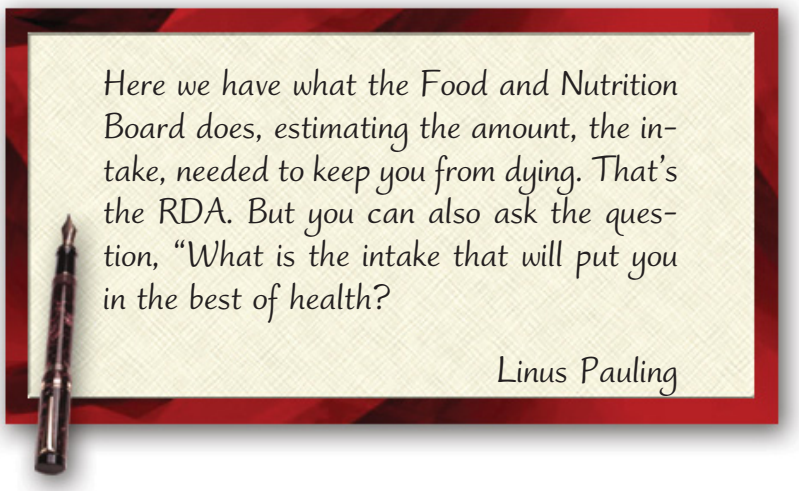

Supplements

Return to T.O.C.

In the following pages, I've reviewed the claims and evidence for over 50 bodybuilding supplements and ingredients. Each review is broken into precise, easy to read sections, and I've made all attempts not to put you to sleep with overly technical jargon. The sections are:

- What is it?
- What is it supposed to do?
- What does the research have to say?
- What does the real world have to say?
- Recommendations.

"What is it?" will explain briefly what the compound is made of, where it comes from, and other pertinent information.

"What is it supposed to do?" will cover what a nutrient supposedly does and how it achieves the effect, assuming it has an effect.

"What does the research have to say?" will briefly look at the studies and sum up the research on a particular nutrient or formula where applicable.

"What does the real world have to say?" will sum up what people have said about their experience with each product. This section is a combination of the feedback I have received over the years and my own first hand experience with the many people I have worked with. Of course, there's no particular formula or hard science behind this section but many readers may find it the most useful part of each review.

"Recommendations" will summarize the potential pros and cons of all the sections and give no B.S. advice on whether a product is worth using.

Following the reviews, my article "*Making Sense of Supplements*" provides a framework for prioritizing and choosing supplements. If you have a limited budget, you want to be sure that you get the most important, or "foundational" supplements in first! This is followed by the "*Supplement Scorecard*" which ranks the supplements reviewed here accordingly.

Amino Acids

Return to T.O.C.

Amino acids are the building blocks of protein. Our bodies break down the proteins we eat into individual amino acids, which are in turn used to create the proteins we need to function. Proteins serve many different roles: structural, transport, catalysis, contraction, and protection against disease.

Amino acids are also involved in many non-protein reactions. Amino acids are used to produce neurotransmitters, hormones, and other metabolites, such as creatine or citrulline. Amino acids may also be used as a source of energy.

There are 20 amino acids that form most mammalian proteins. Each amino acid has a similar structure, but differ in the type of side chain attached to each α–carbon. The side chains confer different properties to each amino acid, and are responsible for the three-dimensional "native" structure of each protein.

Amino acids are classified as essential, non-essential, or conditionally essential:

- essential amino acids are those that our bodies cannot make, and must be supplied by the food we eat. There are 8 essential amino acids: methionine, leucine, valine, isoleucine, threonine, tryptophan, lysine, and phenylalanine. You may see the number listed as 9 or 10 in some places, as arginine and histidine are essential amino acids for infants and very young children.

- non-essential amino acids can be produced by our bodies from other amino acids.

- conditionally essential amino acids are non-essential amino acids that become essential under conditions of physical stress or trauma, when the body cannot produce a sufficient amount to meet demand. Some conditionally essential amino acids are: glutamine, arginine, cysteine and taurine.

Not all amino acids are found in proteins. For example, both taurine and beta-alanine perform non-protein functions exclusively.

L-Arginine

Return to T.O.C.

What is it?

Arginine is a conditionally essential amino acid. It's an essential amino acid in infancy/early childhood, and under stress conditions where the body cannot manufacture sufficient l-arginine to meet increased demand.

Beyond its role in protein synthesis, arginine is a precursor for a number of important metabolites, including creatine and nitric oxide. It is an important intermediate in the urea cycle, and can stimulate the secretion of growth hormone.

What is it supposed to do?

The current interest in arginine and related compounds such as arginine-alpha-ketoglutarate (AAKG) lies in its role in the production of nitric oxide. NO is the new superstar molecule with researchers as it appears to play a role directly or indirectly in almost every aspect of human physiology, such as the immune system, nervous system, circulatory system, and many others.

Arginine is a key component of the NO production pathway (arginine serves as the substrates for the nitric oxide synthase enzyme, which produces citrulline and NO from arginine) which is essential for a cascade of reactions involved in vasodilation and cardiovascular function.

Supplements containing arginine/AAKG are supposed to enhance the production of NO, and increase the "pump" you get during a hard workout in the gym.

What does the research say?

Recent data suggest arginine may have some legitimate uses regarding health and well being. For example, the lining of artery walls called the endothelium needs to dilate and contract effectively.

NO is essential to this function and several studies have found arginine supplements at 8 - 20 grams per day restored endothelial vasodilation in

the coronary arteries and may improves overall blood flow, which is important for people suffering from ischemic issues.

Another study suggested that arginine supplementation greatly improved penile function in men with penile dysfunction as NO is essential for blood flow involved in getting an erection.

Arginine has shown a very good safety profile to date and appears to have virtually no toxic effects. From an athletic/muscle building point of view, things become much less clear. Early studies suggested arginine could increase growth hormone levels, but in truth (a) these effects were found using very high doses and were intravenous and (b) short lived spikes in GH don't appear to have any positive effects on muscle mass or performance in healthy athletes anyway.

NO is a messenger molecule related to virtually every pathway in the human body, one way or another. Therefore, simply raising NO will have both positive and negative effects, most of which are not known at this time.

"NO is a messenger molecule related to virtually every pathway in the human body, one way or another. Therefore simply raising NO will have both positive and negative effects, most of which are not known at this time."

Having chronically elevated levels of NO above normal may not be a good idea. For example, though NO is associated with some potentially positive effects mentioned above, elevated NO levels are also associated with some negative effects. High levels of NO are associated with increased levels of an extremely powerful pro-oxidant called peroxynitrate, which immune cells use to kill pathogens. High levels of peroxynitrate may lead to greater oxidative stress, immune disorders, and increased inflammation. For example, high levels of NO and peroxynitrate are associated with fibromyalgia, chronic fatigue, and multiple chemical sensitivity. Therefore, it might not be a wise idea to have chronically elevated levels, especially if you have any of the aforementioned syndromes.

What does the real world have to say?

A decade ago, arginine had a brief day in the limelight with athletes as a supplement that might stimulate growth hormone. However, its use as a GH releaser never materialized into new muscles for users, so it quickly fell out of favor.

Recently, however, there has been a resurgence of interest in arginine by athletes and supplement companies. This is due to recent findings showing a long list of possible uses with arginine, ranging from possible protec-

tion from heart disease, reducing cholesterol, to increasing blood flow.

This brings us to the new supplements known as "hemodilators" that claim to give you a "perpetual pump" and other marketing buzz words based on elevated NO. These new products are based on a form of arginine called Arginine Alpha-Ketoglutarate, which is simply arginine bound to alpha keto glutarate (AKG), a supplement that had a short life some years ago. Some of these new supplements claim some form of time delay or extended release to keep NO elevated.

There are many problems with the above, some of which I have mentioned already. For one thing, there are no data to show such products keep NO elevated all day, there may be medical and physiological reasons to avoid constantly elevated levels of NO, and there are no studies at all showing such products increase LBM. In fact, there's even been one study that demonstrates that NO supplements are worthless for increasing LBM. One study, sponsored by an NO supplement manufacturer, concluded:

"AAKG supplementation appeared to be safe and well tolerated, and positively influenced 1RM bench press and Wingate peak power performance. AAKG did not influence body composition or aerobic capacity."

"AAKG supplementation appeared to be safe and well tolerated, and positively influenced 1RM bench press and Wingate peak power performance. AAKG did not influence body composition or aerobic capacity"

To say that supplement manufacturers are overstating the muscle building effects of these new (and they are not really new, but are just being repackaged as new) products is being kind…

Interestingly, while some improvements in performance were seen in the above study, these may well be due to the age of the subjects being tested in both studies: 30 - 50 year old men. Middle-aged men are more likely to have some markers of cardiovascular disease, such as elevated homocysteine and asymmetrical dimethylarginine (ADMA) levels. ADMA is a competitive inhibitor of nitric oxide synthase (NOS), which is the enzyme responsible for NO production. So positive performance results in this group may be due to a reduction in ADMA inhibition of NOS, rather than to the increased availability of arginine for NO production. Under normal conditions, arginine is not limiting for NO production, so increasing arginine should not result in increased NO production.

Recommendations

From a health perspective, arginine and arginine alpha-ketoglutarate, may

have some real uses for people with high cholesterol, coronary artery disease, ischemic (meaning a reduced blood flow and oxygen delivery to tissues) and even men with erectile dysfunction. As for athletes, the jury is still out for either arginine or arginine alpha-ketoglutarate.

Bottom line, I would not recommend them to athletes at this time for increasing either muscle mass or performance. For that use, they get a thumbs down.

To discuss NO/Arginine further, you can post in the Members' Area.

Click Here

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Beta-Alanine

Return to T.O.C.

What is it?

Beta-alanine is the only naturally occurring beta amino acid. Beta amino acids have their primary amino groups attached to the beta, rather than the alpha carbon. Although beta-alanine is involved in the formation of other, larger molecules, it is not found in proteins.

What is it supposed to do?

Beta-alanine is being touted as "the new creatine" and the latest breakthrough supplement in the world of sports nutrition. It's used by the body to synthesize carnosine (L-beta-alanyl-L-histidine). Carnosine performs a variety of valuable roles, including: inhibiting the formation of advanced glycation end products (AGEs) which can damage tissues, chelating metal ions, and scavenging free radicals. Carnosine's importance to athletic performance, however, lies in its ability to buffer hydrogen ions produced in skeletal muscle during high intensity exercise.

So why not just use carnosine you ask? Though you will find more in depth information below, here's the reason in a nutshell: Studies show ingested carnosine is simply broken down into its constituent parts and reformed into carnosine. Studies generally find that ingesting beta-alanine is actually superior for increasing tissue carnosine levels then ingesting carnosine itself. More detail to follow…

"The increase in buffering capacity could influence the ability to carry out intense muscular activity."

What does the research say?

An increase in muscle carnosine appears to be an adaptation to resistance training. One recent study discovered that carnosine concentration in the skeletal muscle of competitive bodybuilders was twice that of controls. The researchers noted that the amount of carnosine measured represented 20% of the total buffering capacity of the muscle and stated:

"The increase in buffering capacity could influence the ability to carry out intense muscular activity."

So increasing carnosine in skeletal muscle has the potential to improve

performance. In spite of this, it's unclear if direct supplementation with carnosine will have this effect. Studies are limited on the effects of carnosine supplementation on performance. From what little there is, there does not appear to be any benefit. This may be due to the fact that oral carnosine is broken down by intestinal and plasma carnosinases before significant amounts can be taken up into skeletal muscle.

Very recent research indicates that supplying the carnosine precursor, beta-alanine, may be a far more effective means of increasing muscle carnosine stores. One recent study demonstrated that beta-alanine supplementation increased carnosine in the vastus lateralis by nearly 60% after 4 weeks, and 80% after 10 weeks. In addition, the researchers found that the total work done (TWD) - as measured by a cycling capacity test - improved with supplementation:

"...4 wks beta-alanine supplementation resulted in a significant increase in TWD (+13.0%); with a further +3.2% increase at 10 wks. TWD was unchanged at 4 and 10 wks in the control subjects. The increase in TWD with supplementation followed the increase in muscle carnosine."

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What does the real world have to say?

Beta-alanine is still a very new supplement and requires more extensive research, but "on paper" looks promising so far. Users feel that it helps with recovery and soreness, although the jury is still out whether it actually improves performance or - indirectly - LBM.

This supplement might be especially useful for vegetarians or people who eat limited amounts of meat, as meat is a primary source of dietary carnosine/beta-alanine.

Recommendations

With all that we know about the benefits of carnosine, I give this supplement two thumbs up for anyone interested in general health and well-being. More research needs to be done before it can be recommended as a performance-enhancer, but is certainly worth a try, so I will give it a thumbs up as a supplement worth a shot and a supplement to keep an eye out for as additional studies come in.

Although studies are limited as to what the optimal dose is, 3 - 6 g/day

appears to be an effective dose. So, If you see a few hundred milligrams in a product, it's probably worthless.

To discuss Beta-Alanine further, you can post in the Members' Area.

Click Here

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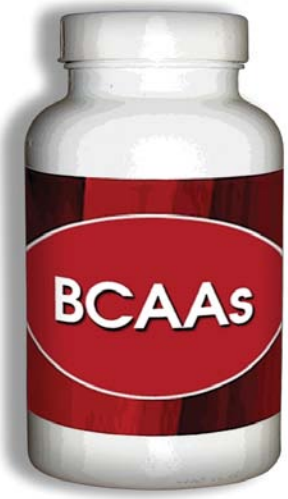
Branched Chain Amino Acids (BCAAs)

Return to T.O.C.



What are they?

The branch chain amino acids (so named because they branch off another chain of atoms rather than form a straight line as other amino acids do) are leucine, valine and iso-leucine.

What are they supposed to do?

BCAAs are supposed to enhance lean mass gains by a) reducing muscle catabolism; and b) stimulating the synthesis of muscle protein.

What does the research say?

The BCAA's are the amino acids that are primarily used (oxidized) during exercise and make up to one third of the amino acids in muscle tissue. It has been known for a long time that BCAAs play a critical role in the turnover of lean body tissues (muscle) and is muscle sparing (i.e. anti-catabolic) in a variety of muscles wasting states. Of the three BCAAs, L-leucine appears to be the most important to preserve hard earned muscle mass; intense exercise and certain disease states have been shown to eat up a great deal of L-leucine.

So far so good! On the research front, some studies have found the consumption of BCAA before endurance exercise may decrease the rate of protein degradation and may have a sparing effect on muscle glycogen degradation, and depletion of muscle glycogen stores.

However, leucine supplementation at 200 mg per kg of body weight prior to anaerobic running exercise (sprinting) did not improve performance.

Truth is, research to date with BCAAs and performance has been contradictory, at best. One of the major drawbacks of the BCAAs as a supplement is dosage. It takes very high doses to see any ergogenic effect, assuming there are any ergogenic effects to be had, as studies are still limited and or contradictory.

Recent evidence also suggests that BCAA-stimulated muscle protein syn-

thesis is also limited in duration. A recent review on the role of BCAAs in stimulating protein synthesis following exercise stated:

"Providing increased exogenous BCAAs is likely to stimulate MPS (and possibly decreased muscle protein breakdown), but the effect is likely to be short-lived given the muscle-full phenomenon."

"Providing increased exogenous BCAAs is likely to stimulate MPS (and possibly decreased muscle protein breakdown), but the effect is likely to be short-lived given the muscle-full phenomenon."

What does the real world have to say?

Within the context of a high protein diet, extra BCAAs don't appear to be particularly effective. I don't know of anyone that added extra LBM because they started supplementing with BCAAs. There are some who feel they're helpful for helping to maintain LBM during a cutting phase. This is something that has not been directly evaluated under controlled conditions, so it's strictly speculative at this point.

Recommendations

Although BCAAs supplementation may or may not be effective, it's expensive when one factors in the amounts needed to boost performance. The good news, however, is that proteins, in particular whey protein, are very high in BCAAs and this may be yet another reason whey is so popular with athletes and so impressive in the research.

In relationship to the functions they play in the body, branched chain amino acids get a thumbs up from me, but as a supplement they get a thumbs down, at this time. It's far more cost effective to use a high BCAA content protein supplement than to take BCAAs supplements in capsule form, due to the high doses needed.

To discuss BCAAs further, you can post in the Members' Area.

Click Here

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Citrulline

Return to T.O.C.

What is it?

Citrulline is a non-essential amino acid that plays a role in a variety of metabolic processes. Citrulline is an essential player in the detoxification on ammonia and other byproducts of metabolism, such as lactate. Citrulline readily converts to the amino acid arginine and is an intermediate in the urea cycle.

What is it supposed to do?

Citrulline is reported to improve performance by improving the clearance of ammonia and lactate, both of which build up quickly during exercise and cause a decrease in performance as levels increase. Citrulline (usually in the form of citrulline malate) improves aerobic capacity and endurance by influencing lactic acid metabolism - ultimately reducing fatigue. As most people know, ammonia is toxic to cells. The body deals with ammonia via what is called the urea cycle, by which potentially toxic metabolites are made less toxic and excreted via the kidneys and urine. As a part of the urea cycle, citrulline is essential to detoxify and remove ammonia as well as lactate.

As mentioned, citrulline readily converts to arginine, which has gotten much attention recently due to it's being a precursor to nitric oxide (NO), a key signaling molecule (see arginine section for additional comments on NO) in the human body. NO is a vasodilator that mediates the relaxation of smooth muscle. NO is a key signaling molecule in the human body for a huge number of functions and is beyond the scope of this chapter. In summary: Citrulline may improve performance by improving the clearance of ammonia and lactate during exercise, but other effects may include an improvement in ATP replenishment post-workout.

What does the research have to say?

Clinically, citrulline has shown real promise in the treatment of various afflictions, such as fatigue in geriatric settings as well as improvements in mental acuity and resistance to mental fatigue and improvements in reducing fatigue in postoperative patients. Citrulline has been used in vari-

ous European countries for almost two decades. Though human studies are limited, they do exist, and findings have been promising (with some exceptions). Animal studies find improvements in endurance as well reductions in ammonia in response to intense exercise. One recent study done with eighteen men complaining of fatigue (but with no documented disease) were studied. According to the study:

"CM ingestion resulted in a significant reduction in the sensation of fatigue, a 34% increase in the rate of oxidative ATP production during exercise, and a 20% increase in the rate of phosphocreatine recovery after exercise…"

This result led the researchers to conclude:

"...the changes in muscle metabolism produced by CM treatment indicate that CM may promote aerobic energy production."

Other studies, although limited, generally support the use of citrulline as a supplement that improves endurance, but effects on strength and or LBM are not well studied. All is not perfect however as a recent study actually found citrulline reduced time to exhaustion in, healthy male and female volunteers given citrulline compared to placebo. Translated, in this study, citrulline actually decreased endurance! The study also found the group given citrulline had higher rates of perceived exertion during exercise. The study concluded:

"...contrary to the hypothesized improvement in treadmill time following L-citrulline ingestion, there is a reduction in treadmill time following L-citrulline ingestion…"

What does the real world have to say?

Very little feedback has come in with this supplement, as it's fairly new to the sport nutrition market and not well known. Endurance athletes have generally been positive about it and, as expected, strength athletes have been negative. Admittedly, the sample size was small.

Recommendations

As most people know, the new products calling themselves "hemodialators" are simply based on arginine and are pushed hard as the next "big thing" in bodybuilding (even though studies have not been impressive).

"CM ingestion resulted in a significant reduction in the sensation of fatigue, a 34% increase in the rate of oxidative ATP production during exercise, and a 20% increase in the rate of phosphocreatine recovery after exercise...the changes in muscle metabolism produced by CM treatment indicate that CM may promote aerobic energy production."

Citrulline appears to be better at increasing both arginine and NO then arginine itself. So, those taking these arginine-based "hemodialators" would be better off taking citrulline. The minimum dose for effects appears to be 6 grams, generally taken before workouts on an empty stomach. Higher doses (up to 18 g) have been used in studies without any apparent ill effects. Although citrulline will probably have no direct effects on strength and LBM, it may still benefit strength athletes indirectly by allowing a few more reps (due to its effects on lactate and ammonia) with a given weight and perhaps, improved aerobic metabolism, cellular energy production, and muscular recovery. I am going to put citrulline in the "might be worth a try" category of the e-book and a borderline thumbs up at this time.

To discuss Citrulline further, you can post in the Members' Area.

Click Here

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L-Glutamine

Return to T.O.C.

What is it?

L-glutamine is a conditionally essential amino acid. It's considered to be one of the most important amino acids when the body is under severe stress, such as following surgery, trauma, burns, etc.

What is it supposed to do?

Glutamine participates in a wide variety of non-protein activities in the body. Supplemental glutamine may enhance immunity and promote muscle recovery, along with other potential health benefits.

What does the research say?

The 'non-essential' amino acid glutamine has been getting a great deal of attention over the past few years in sport nutrition publications and scientific journals and for good reason. Though it might not be considered "essential," glutamine appears to have many potential benefits for people interested in gaining new muscle and/or preserving that hard earned muscle.

Glutamine is required for countless functions in the human body from immune system function, to liver function, to gastrointestinal integrity, to name only a few. Supplement companies have taken to adding glutamine to various products and athletes have taken to adding glutamine to their diet.

For example, it is well known that low plasma glutamine levels are associated with a loss of lean body mass (muscle) and intense exercise is known to reduce glutamine stores. One study attempted to directly link glutamine levels with lean tissue loss.

The study divided 34 healthy men into three groups. One group did intense aerobic work (running), another group did intense anaerobic work (weight lifting and sprinting), and the third group was sedentary (AKA couch potatoes).

The authors of this study found that the greatest loss of muscle was found in those men who had the lowest baseline glutamine levels, which demonstrates just how important this amino acid is for maintaining hard earned muscle tissue. Plain and simple, the harder you train the more glutamine you drain!

Because of its potential effects on the immune system, the use of glutamine may also help to prevent overtraining syndrome (OTS) in athletes who train too long and too hard. Several studies have suggested glutamine levels may be indicators for OTS.

"Because of its potential effects on the immune system, the use of glutamine may also help to prevent overtraining syndrome (OTS) in athletes who train too long and too hard."

Another interesting effect of glutamine is it may increase growth hormone levels (GH). One study took nine healthy subjects and fed them two grams (2000 mg) of glutamine dissolved in a cola drink. Eight out of the nine subjects responded to the oral glutamine intake with a four fold increase in growth hormone (GH) output.

This study was particularly interesting because: (a) the glutamine was given orally and not by intravenous administration like so many studies and (b) the study only used two grams of glutamine. Most studies that showed any effect on GH used very large doses and were given directly into the veins of the poor participants.

That only two grams of glutamine taken orally had such an effect of GH bodes well for the use of glutamine by athletes. Whether or not a short spike in GH will lead to new muscle is another question however, and in truth, short-lived spikes in GH in healthy young athletes do not appear to effect muscle mass.

Finally, glutamine may be useful in replenishing glycogen stores in muscle after intense exercise. Glycogen is stored in muscle cells for energy and other functions such as cell volume.

As most athletes know, glycogen is rather important stuff to have around when you want to perform well. The researchers took six healthy volunteers and made them exercise at 70 - 140 percent of maximal oxygen consumption (a fancy way of saying they worked 'em real hard!) to deplete their muscle glycogen stores.

They found that the glutamine enhanced glycogen storage after the intense bout of exercise. Exactly how glutamine improves glycogen storage

is not clear. It might somehow improve the uptake of glucose into muscle directly, or it might be that the glutamine is itself being converted into glucose and then being stored as glycogen in the muscles.

The authors of the study seem to suggest the latter. Either way, this might just be one more amazing benefit of this amino acid for athletes.

What does the real world have to say?

Many trainers recommend glutamine supplementation as a preventive measure, to limit the depletion of muscle glutamine stores that occur during strenuous exercise. Needless to state, no one have ever exploded with muscle from the simple addition of glutamine to the diet.

Recommendation

Although it doesn't directly enhance performance or LBM, glutamine gets a thumbs up as a general health improving supplement that appears to have applications for athletes. 5 - 20 grams per day of glutamine added to a post workout shake is the norm.

To discuss Glutamine further, you can post in the Members' Area.

Click Here

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Ornithine Alpha-Ketoglutarate (OKG)

Return to T.O.C.

What is it?

Ornithine is a non-protein amino acid that is an integral part of the urea cycle, which the body uses to dispose of excess nitrogen. Ornithine alpha-ketoglutarate is a salt of ornithine and alpha-ketoglutarate, which is the carbon skeleton of the amino acid glutamate.

What is it supposed to do?

Ornithine alpha-ketoglutarate is alleged to have anti-catabolic/anabolic and immune modulating activities. It is also used to increase the secretion of growth hormone.

What does the research say?

There's extensive research on the value of supplementing enteral/parenteral feedings of burn/trauma patients with ornithine alpha-ketoglutarate. Experiments with both rodents and humans have demonstrated that OKG limits muscle protein breakdown, improves gut health and increases the muscle glutamine pool. OKG also has immunomodulating effects: in rats, OKG supplementation increases the weight of the thymus (an important organ in the immune system) and improves the responses of specific immune cell types (macrophages and neutrophils) in under burn or stress conditions.

OKG also stimulates the secretion of important anabolic hormones. Fifteen grams of OKG added to the feeding solutions of children receiving total parenteral nutrition resulted in improved growth and a significant increase in IGF-1. Enterally fed trauma patients also experienced increased levels of IGF-1, along with insulin and growth hormone vs. controls.

At least part of OKG's effects are mediated by its role as an arginine precursor and the latter's function as a substrate for nitric oxide (NO) synthesis. It's clear that OKG is a far more potent precursor for arginine synthesis than ornithine itself.

What does all this mean for healthy athletes?

There is virtually no data on the utility of OKG supplementation in healthy humans. Rat studies are mildly suggestive of some potential benefits, such as enhanced insulin secretion, which might be useful for pre- and/or post-workout recovery. A study on rats exercised to exhaustion demonstrated that OKG increased glutamine synthesis and resulted in enhanced buffering of ammonia. This is an effect that - if it occurs in humans - might enhance performance or recovery.

"There is virtually no data on the utility of OKG supplementation in healthy humans."

OKG is sometimes added to NO supplements, thanks to its role in NO production. Since OKG converts to arginine, however, and NO supps already contain arginine (usually as AAKG), its presence is redundant. OKG supplementation appears to increase locomotor activity in rats, which means it may have a stimulating effect and could provide a workout boost, but it's unknown if it has this effect in humans. Many NO supplements contain caffeine or other stimulants, which makes it impossible to tell what - if any - stimulating effects OKG itself might have.

As for its effects on GH, there is no evidence that the temporary spikes in GH induced by amino acids have any effect on mass gains or strength, as outlined in the section on GH releasing supplements.

What does the real world have to say?

Some give high marks to NO supplements as workout energizers, apart from the "pump," so it's possible - but far from certain - that OKG (if included in the formula) could contribute to that effect. As far as OKG alone, feedback from people taking it alone is essentially non-existent. Very few people consume OKG alone, or in doses that reflect what's used in studies - so it's virtually impossible to get accurate feedback on OKG.

Recommendations:

My recommendations for OKG are the same as for arginine: it may have some health uses, but I see no reason to recommend it to anyone looking to add mass or strength. Although useful human data is lacking on OKG's effects on strength or LBM, what is known, however, is that NO and GH supps do nada (read jack sh&%) for gains in lean body mass, so whatever positive effects OKG may have, muscle growth isn't one of them. It does appear to have some medical uses, and perhaps health uses, but it gets thumbs down as a muscle builder at this time.

To discuss Ornithine Alpha-Ketoglutarate further, you can post in the Members' Area.

Click Here

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Taurine

Return to T.O.C.

What is it?

Taurine is a ubiquitous non-essential amino acid found throughout the human body, similar to glutamine. It's considered non-essential because the body can make taurine from the amino acids methionine and cysteine, with the help of vitamin B_6.

Although it may be non-essential, supplemental taurine may have some potentially interesting effects from which athletes may benefit. In fact, it should probably be listed as conditionally essential, which means under certain circumstances, it becomes essential to the human body.

What is it supposed to do?

Much of taurine's exact role in human biology is still being elucidated, but what has been looked at is compelling. Taurine is intimately connected with cell volume, blood pressure, insulin metabolism, the ability of muscles to contract correctly and hundreds of other functions known and yet unknown.

What does the research say?

For example, there is a steady decline in taurine levels as we age, which may lead to a host of problems. One study in which rats were fed taurine at 1.5 percent of calories found taurine supplementation blunted age-related declines in serum IGF-1, an important anabolic hormone essential to muscle growth and protein synthesis.

Another study found that supplemental taurine in aging rats corrected the age-related decline in the ability of the rat's muscle to contract.

The study suggested that an age-related decline of taurine content could play a role in the alteration of electrical and contractile properties of muscles observed during aging and that supplemental taurine corrected the decline.

The study concluded:

"...these findings may indicate a potential application of taurine in ensuring normal muscle function in the elderly."

"...these findings may indicate a potential application of taurine in ensuring normal muscle function in the elderly."

This has very exciting possibilities in aging populations, but human trials are still lacking.

Another exciting area of research for taurine is its possible role in managing diabetes and improving insulin sensitivity. Several studies in both rats and humans suggest taurine can play a role in improving several indices of diabetes, such as insulin metabolism, high cholesterol levels and high blood pressure, as well as others. Diabetics appear to be chronically low in taurine.

For example, one study found Taurine attenuated hypertension and improved insulin sensitivity in rats made insulin resistant by a high fructose diet. Treatment with 2 percent taurine put in the rats' drinking water prevented the blood pressure elevation and attenuated the hyperinsulinemia (high insulin levels) in fructose fed rats and prevented the large spike in glucose levels in response to an oral glucose load.

"...thus taurine supplementation could be beneficial in circumventing metabolic alterations in insulin resistance."

The study concluded:

"...thus, taurine supplementation could be beneficial in circumventing metabolic alterations in insulin resistance."

Several studies have found this effect in rats fed taurine and made diabetic.

One human study looked at the ability of taurine to prevent blood platelet aggregation or "sticky" blood cells in diabetics. This is important because "sticky" blood platelets are related to the development of heart attacks and is a particular issue to diabetics. The study found that supplemental taurine made the diabetic's blood aggregation or "stickiness" equal to that of healthy controls.

What does the real world have to say?

So what use does taurine have to athletes and healthy people? Well again, as is so often the case, human studies in healthy athletes are lacking, so it's difficult or near impossible to make solid recommendations at this time. Taurine might be a great supplement to healthy athletes or it may only

work in those populations who chronically lack taurine in their tissues, such as the aging, diabetics and others.

One thing is for sure, as with pretty much all amino acids, multi-gram doses will probably be needed for any effect and any product that sprinkles in a few milligrams will be of little use to the buyer.

Recommendations

It would be great if we had solid data showing some positive effects in athletes. And it would be nice if we knew what the effective dose was. Sadly, we have neither at this time. However, due to the sheer amount of overall data we have, I am still giving taurine a tentative thumbs up as a "worth a try" supplement.

To discuss Taurine further, you can post in the Members' Area.

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L-Tyrosine

Return to T.O.C.

What is it?

One amino acid that has not gotten a great deal of attention by athletes is the amino acid L-Tyrosine. L-Tyrosine is found in high amounts in protein foods and the body can make L-Tyrosine from amino acid phenylalanine, technically making it a "non-essential" amino acid.

What is it supposed to do?

This often overlooked amino acid plays many important roles in human metabolism. L-Tyrosine is a precursor or "building block" to the neurotransmitters responsible for maintaining metabolic rate. L-Tyrosine is the direct precursor to stimulatory neurotransmitters such as epinephrine and norepinephrine (i.e. adrenaline) as well as certain thyroid hormones and dopamine.

Due to the fact that Tyrosine is essential to the production of all the above stimulatory hormones and neurotransmitters, some consider it an amino acid with mild stimulant-like properties to the metabolism and mental focus. Some weight loss supplements contain L-Tyrosine in an attempt to supply this essential building block in hopes it will help maintain a higher metabolism.

What does the research say?

Though Tyrosine has not been shown to be an effective weight loss agent on its own, several studies have shown it can improve the anorectic (appetite suppressive) effects of the herbal weight loss products containing ephedrine and caffeine and OTC diet drugs containing phenylpropanolamine.

Several studies done by the US Army showed soldiers given supplemental L-Tyrosine were more resistant to cold temperatures than those not getting the amino acid. One recent study found that 21 cadets, fed 2 grams of tyrosine a day then subjected to a demanding military combat training course, reduced the effects of stress and fatigue on cognitive task performance. So, tyrosine may be a stress-fighting nutrient.

What does the real world have to say?

It's not uncommon that people are given advice on what to eat in regards to the food's amino acid content. For example, many people have probably heard at one time or another, "If you want to be more alert, eat a high protein food." This advice is probably due to the high l-tyrosine content of the food. Conversely, people are also given advice that to relax, they should eat foods such as milk and turkey, which are high in the amino acid l-tryptophan. L-Tryptophan is a building block of the neurotransmitter serotonin, which is known to help with sleep and relaxation.

"For example, many people have probably heard at one time or another, 'if you want to be more alert, eat a high protein food.' This advice is probably due to the high l-tyrosine content of the food."

Some strength athletes have found that by taking 500 to 2000 mg of tyrosine prior to exercise, they have more energy, but no studies to date have found this to be an effect of tyrosine.

However, because it may be a mild stimulant and works at the level of the central nervous system, people using MAO inhibitors, pregnant women, people with high blood pressure and people sensitive to stimulants, should probably avoid high doses of tyrosine.

Recommendations

For general mental focus and stress fighting, as well as for pre-workout, or mixed with the various weight loss agents, tyrosine gets a thumbs up; but for any direct effects on anabolism (muscle growth) it gets a thumbs down.

To discuss Tyrosine further, you can post in the Members' Area.

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Metabolites

Return to T.O.C.

There are a number of naturally occurring metabolites that can be taken in supplemental form, to raise levels in the body higher than can be achieved through diet alone. The idea is to amplify the effects that the compound has, with the goal of enhancing performance and/or improving body composition.

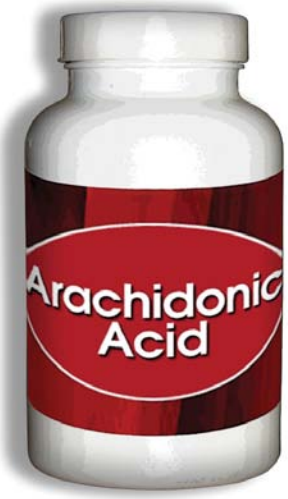
Because they are compounds naturally produced in the body, toxicity is less likely to be a problem, although there may be side effects from ingesting excessive amounts.

The compounds that follow aren't an exhaustive list: there are hundreds of potentially useful metabolites that might be taken in supplemental form. These are simply the ones that most commonly turn up in commercial supplements. It's a list that will almost certainly be added to in the future.

It's important to remember that a compound that's ineffective for building muscle or increasing strength might still have positive effects on health and/or prevention of disease. Your state of health will have a significant impact on your results, so certain nutrients might be worthwhile to take, in spite of having little direct effect on LBM or performance.

Arachidonic Acid

Return to T.O.C.



What is it?

Arachidonic acid (AA) is a naturally occurring polyunsaturated fat, belonging to the Omega-6 family of fatty acids and is found in cell membrane phospholipids. It's formed in the human body from the essential fatty acid linoleic acid (LA) or ingested pre-formed in various foods, with highest amounts found in red meat, egg yolks, and other animals based foods. From AA, highly unsaturated biologically active compounds such as prostaglandins, prostacyclin (PGI12), leukotrienes, and thromboxanes are formed.

What is it supposed to do?

The metabolism of AA is extremely complicated and far beyond the scope of this section. The many biologically active downstream metabolites of AA mentioned above are still under investigation, with new roles for each being discovered all the time. Relating to the issue that concerns the reader of this e-book (e.g., effects on strength, performance, and body composition), AA plays a role in the inflammatory response, which appears to have direct effects on protein synthesis. In particular, the prostaglandin PGF2α has been identified as an important mediator of protein synthesis. In theory, an increase in the tissue levels of PGF2α (via ingestion of AA) might alter the anabolic to catabolic balance which would increase muscle mass.

Other lines of evidence that support AA metabolites as being essential for protein synthesis come from studies that found that the cyclooxygenase (COX) enzyme inhibitors ibuprofen and acetaminophen greatly diminish the anabolic response to resistance exercise by inhibiting the normal post-exercise increase in levels of PGF2α. As these OTC drugs exhibit their anti-inflammatory actions by inhibiting the synthesis of prostaglandins, and it's been found they reduce protein synthetic rates in response to weight training, it's additional support for the concept that prostaglandins play an essential role in the anabolic response to exercise. Again, that's a generalization of an extremely complicated system.

The essential take home of the above is, prostaglandins are derived from dietary and in-vivo conversion of AA and appear up-regulate recovery mechanisms including: inflammation and protein synthesis within skeletal

muscle in response to resistance training.

What does the research have to say?

Most of the research that suggests AA has anabolic and or anti-catabolic effects via its conversion to PGF2α (and perhaps other metabolites yet to be elucidated) has been in-vitro (test tube) research. Other then intellectually interesting, very little can be concluded as it applies to living systems. Although there have been studies that examined the effects of humans ingesting AA, these studies did not examine the effects on whole body protein synthesis or skeletal muscle mass or tissue levels of PGF2α. However, one recent study did look directly at the effects of AA on strength and body composition.

The 50 day study consisted of thirty-one resistance-trained males who were randomly assigned to a placebo (P: n = 16; 1 g capsulated corn oil/day) or AA group (AA: n = 15; 1 g capsulated AA/day). Although diet was not controlled for (a major flaw of this study, BTW), they were given supplemental protein powder to assure an adequate protein intake while participating in a 4-day per week resistance training regimen which consisted of a twice per week upper/lower split.

The researchers examined various downstream metabolites of AA, such as: prostaglandin E2 (PGE2), prostaglandin F2α (PGF2α), interleukin-6 (IL-6), as well as hormonal effects on free testosterone, total testosterone and cortisol. They also took muscle biopsies to look at any changes in myosin heavy chain isoform. The study did not find statistically significant differences between the group getting the AA and the placebo group. There was a trend in the changes of some of the outcomes examined, but none of them reached statistical significance which equates to no differences between groups. The researchers concluded:

"Results suggest that AA supplementation during resistance training may exert some potentially favorable alterations IL-6 levels and prostaglandin levels and that additional research is necessary to further examine this hypothesis. "

What does the real world have to say?

Interestingly, feedback for this supplement has been generally positive, though not universally so. Some people claim they get stronger and feel additionally sore from their workouts, which they attribute to the known

"Results suggest that AA supplementation during resistance training may exert some potentially favorable alterations IL-6 levels and prostaglandin levels and that additional research is necessary to further examine this hypothesis."

effects of AA on inflammation.

Recommendations:

The use of AA as a dietary supplement is a controversial and contentious idea. The reason is that AA is associated with a long list of possible diseases and inflammatory conditions due to its role as a precursor to the pro-inflammatory metabolites mentioned above. Inflammation, and a high intake of AA or LA (linoleic acid - omega-6 lipid), is associated with all manner of inflammatory conditions and or diseases that are known to have chronic inflammation as an important mediator of the process. It's generally believed that the high intakes of LA and low intakes of omega-3 fats (which have anti-inflammatory effects) are partially responsible for the high levels of various inflammatory conditions suffered by typically affluent Western countries. The list of conditions and diseases either caused by or negatively impacted by, inflammation is huge, but includes: coronary heart disease (CHD), psoriasis, asthma and rheumatoid arthritis, diabetes, and many other conditions and diseases.

Of course inflammation is not all bad and we would not live long without an inflammatory response to various pathogens and other challenges where the inflammatory response is an essential part of our immune system. The issue is chronically elevated inflammation. Again, this is a huge topic, an incredibly complicated topic, and to make matters worse, a topic with plenty of unknowns. Thus, no absolutes can be stated at this time.

In general, however, data generally supports the notion that most people already take in more inflammatory causing fats and pre-formed AA than is healthy, and not enough omega-3 fats in the form of fish oils, flax, etc. So, adding additional AA in the form of a supplement may not conducive to overall health and well-being.

There are simply more questions here then answers. Would a gram (1000 mg) of AA per day given to a healthy athlete do them any real harm? What if they take additional omega-3 with it in an attempt to counter some of the negative effects? Is the reputation of foods such as red meat and whole eggs as muscle builders due to their AA content? The answer to all of those questions is unknown.

All things taken together, including the fact that the only study looking directly at the effects of AA on strength-trained men found essentially no

benefits, AA must get a thumbs down from me at this time.

To discuss Arachidonic Acid further, you can post in the Members' Area.

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Creatine Monohydrate

Return to T.O.C.

What is it?

Creatine is formed in the human body from the amino acids methionine, glycine, and arginine. Creatine is stored in the human body as creatine phosphate (CP) or phosphocreatine. The average person's body contains approximately 120 grams of creatine stored as creatine and creatine phosphate.

Creatine can also be supplied by foods. Certain foods such as beef, herring, and salmon, are fairly high in creatine, but a person would have to eat pounds of these foods daily to equal what can be found in one teaspoon of powdered creatine from a supplement.

What is it supposed to do?

During short maximal bouts of exercise such as weight training or sprinting, stored adenosine triphosphate (ATP) is the dominant energy source. However, stored ATP is depleted rapidly. To give energy, ATP loses a phosphate and becomes adenosine diphosphate (ADP). At this point, the ADP must be converted back to ATP to derive energy from this energy producing system.

When ATP is depleted, it can be recharged by creatine, in the form of creatine phosphate. That is, the CP donates a phosphate to the ADP making it ATP again. An increased pool of CP means faster and greater recharging of ATP and, therefore, more work can be performed for a short duration, such as sprinting, weight lifting and other explosive anaerobic endeavors.

Other effects of creatine may be increases in protein synthesis and increased cell hydration, though researchers are still elucidating the mechanisms.

What does the research say?

The above is, of course, an immensely oversimplified review of an exceptionally complex system, but the basic explanation is correct. To date, research has shown ingesting creatine can increase the total body pool of CP which leads to greater generation of force with anaerobic forms of exercise,

such as weight training, sprinting, etc.

Early research with creatine showed it can increase lean body mass and improve performance in sports that require high intensity intermittent exercise such as sprinting, weight lifting, football, etc.

Creatine has had spotty results in research that examined its effects on endurance oriented sports such as swimming, rowing and long distance running, with some studies showing no positive effects on performance with endurance athletes.

Whether or not the failure of creatine to improve performance with endurance athletes was due to the nature of the sport or the design of the studies is still being debated. But one thing is for sure; the research is stronger in high intensity sports of short duration.

Recent findings with creatine monohydrate have confirmed previous research showing it's a safe and effective supplement. More recent research has focused on exactly how it works, and has looked deeper into its potential medical uses.

Several studies have shown it can reduce cholesterol by up to 15%, and may be useful for treating wasting syndromes such as HIV. Creatine is also being looked at as a supplement that may help with diseases affecting the neuromuscular system, such as muscular dystrophy (MS) and others.

A plethora of recent studies suggest creatine may have therapeutic applications in aging populations, muscle atrophy, fatigue, gyrate atrophy, Parkinson's disease, Huntington's disease, and other mitochondrial cytopathies, neuropathic disorders, dystrophies, myopathies and brain pathologies.

The importance of creatine is underscored by creatine deficiency disorders: inborn errors of metabolism that prevent creatine from being manufactured. People born without the enzyme(s) responsible for making creatine suffer from a variety of neurological and developmental symptoms which are mitigated with creatine supplementation.

As for safety, some have suggested that creatine might increase the need for extra fluid intake to avoid potential dehydration and muscle pulls. Still, creatine has not been shown to increase either dehydration or muscle pulls

in the research. In some people, creatine may increase a by-product of creatine metabolism called creatinine, which is a crude indicator but not a cause of kidney problems.

Some doctors have mistakenly thought that high creatinine levels (in athletes using creatine) are a sign of kidney problems, but that is not the case.

Creatinine is not toxic to the kidneys and most doctors are not aware that creatine may raise creatinine levels with no toxicity to the kidneys. People with pre-existing kidney problems might want to avoid creatine due to the effects it can have on this test, though creatine supplementation has never been shown to be toxic to the kidneys and the vast number, of studies to date have found creatine to be exceedingly safe.

It's interesting to note that there has been a concerted effort by many groups and ignorant medical professionals to portray creatine as being somehow poorly researched (flatly untrue) and unsafe for long term use.

They systematically ignore the dozens of studies that exist showing it's both safe and effective. Even more bizarre, they ignore the recent studies that are finding creatine may help literally thousands of people with the aforementioned diseases. This is unscientific, unethical, and just plain immoral, in my view.

One question that often comes up regarding creatine is whether or not the loading phase is required. Originally, the advice for getting optimal results was to load up on creatine followed by a maintenance dose thereafter. This advice was based on the fact that the human body already contains approximately 120 grams of creatine (as creatine and creatine phosphate) stored in tissues and to increase total creatine stores, one had to load for several days in order to increase those stores above those levels.

The idea also seemed to work well, in practice, with people noticing considerable increases in strength and weight during the loading phase. All was not perfect however as many people found the loading phase to be a problem, with gastrointestinal upset, diarrhea and other problems. At the very least, loading was inconvenient and potentially expensive.

The need for a loading phase was a long held belief, but is it really needed to derive the benefits of creatine? The answer appears to be no, as both

research and real world experience have found the loading phase may not be needed after all. A 1996 study compared a loading phase vs. no loading phase among 31 male subjects.

The subjects loaded for 6 days using 20 g/day and a maintenance dose 2 g/day for a further 30 days. As expected, tissue creatine levels went up approximately 20 percent and the participants got stronger and gained lean mass. Nothing new there! And, not surprisingly, without a maintenance dose creatine levels went back to normal after 30 days.

Then the group was given 3g of creatine without a loading dose. The study found a similar -– but more gradual -– increase in muscle creatine concentrations over a period of 28 days. The researchers concluded:

"...a rapid way to creatine load human skeletal muscle is to ingest 20 g of creatine for 6 days. This elevated tissue concentration can then be maintained by ingestion of 2 g/day thereafter. The ingestion of 3 g creatine/day is, in the long term, likely to be as effective at raising tissue levels as this higher dose."

A more recent study done in 1999 found that 5 g of creatine per day without a loading phase in 16 athletes significantly increased measures of strength, power, and increased body mass without a change in body fat levels (whereas the placebo group showed no significant changes).

The researcher of this 1999 study concluded:

"...these data also indicate that lower doses of creatine monohydrate may be ingested (5 g/d), without a short-term, large-dose loading phase (20 g/d), for an extended period to achieve significant performance enhancement."

So, if you have suffered through the loading phase in the past thinking it was the only way to maximize the effects of your creatine supplement, it appears you can rest assured you don't have to go through all that hassle. A 3 - 5 gram per day dose over an extended period of time will probably do the same thing.

What does the real world have to say?

What can I say? Creatine monohydrate is one of the most widely used supplements in bodybuilding, and I know of very few people who feel that they haven't gotten good results from using it.

"...a rapid way to creatine load human skeletal muscle is to ingest 20 g of creatine for 6 days. This elevated tissue concentration can then be maintained by ingestion of 2 g/day thereafter. The ingestion of 3 g creatine/day is, in the long term, likely to be as effective at raising tissue levels as this higher dose."

Recommendations:

Creatine can be found in the form of creatine monohydrate, creatine citrate, creatine phosphate, tri-creatine malate, creatine-magnesium chelate and even liquid "creatine serum". The newest form being touted as the best invention since the discovery of testosterone is creatine ethyl ester. However, the vast majority of research to date showing creatine effects on muscle mass and performance used the monohydrate form and most creatine found in supplements is in the monohydrate form.

There are many and surprisingly complicated problems with the above forms, but I will do my best to cover the essential issues. For one thing, these forms have little or no research supporting any of their claims, some of which are either totally outlandish, or biologically impossible. Many companies selling these products make claims, for example, that creatine monohydrate is poorly absorbed and or poorly metabolized by the body. This is simply untrue: research has found that creatine monohydrate is highly absorbable. Some claim less "bloating" or other supposed effects of monohydrate, but don't have a drop of data to support the claim, or even a feasible theory as to why their form would not have the effect vs. the monohydrate form.

They often claim dramatically improved absorption over monohydrate (without data), fewer side effects (without data), the ability to reduce the number of non-responders to creatine (without data), etc. Are you starting to see a theme here?!

Now, it's not impossible for example, that a creatine citrate or malate (both of which are simply creatine bound to a TCA cycle intermediate) may work for a higher percentage of people than the monohydrate form, thus reducing the number of non-responders, but it has yet to be proven.

It may be that the creatine-magnesium chelate form – the most interesting form of the group in my view – may be superior to the monohydrate form for adding LBM or strength, but there has yet to be a single head-to-head study that compared one version to the other. That people are getting some results from these new forms is all well and fine, but are those results above and beyond that of monohydrate? If so, is it simply from the malate, citrate, or magnesium? If a study was to find that an equal amount of creatine-malate, citrate, etc. was 10 percent more effective than monohydrate, but was 4 times as expensive, would you get the same results just

"...these data also indicate that lower doses of creatine monohydrate may be ingested (5 g/d), without a short-term, large-dose loading phase (20 g/d) for an extended period to achieve significant performance enhancement."

taking a little more monohydrate? The answer to all those questions, which must be answered to recommend using any of these new forms, is (drum roll) unknown.

So, here we have what may be the most well-researched supplement known to mankind (the monohydrate form), that has been shown to be cheap, safe, and effective, and people clamor for more expensive, poorly researched forms (e.g., malate, citrate, etc.), because some supplement companies tell them it's superior to the monohydrate form! Now, if people want to spend their money on other forms of creatine, there is nothing wrong with that per se, but they should at no time be under the impression (no matter how much the supplement company selling it claims) that what they are buying has been proven to be superior to the monohydrate form.

For increases in strength, LBM, and performance, creatine monohydrate gets an enthusiastic thumbs up.

To discuss Creatine Monohydrate further, you can post in the Members' Area.

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Carnitine

Return to T.O.C.

What is it?

L-Carnitine is often referred to as an "amino acid like" substance. The body synthesizes Carnitine from the amino acids L-Lysine and L-methionine. High levels of carnitine can be found in animal meats, especially red meats, from cows, lamb, and sheep.

Carnitine supplements come in a number of different forms. The most common are l-carnitine-l-tartrate, acetyl-l-carnitine, and propionyl-l-carnitine.

What is it supposed to do?

Carnitine has many functions in the human body, but is best known for its ability to shuttle long chain fatty acids across the membrane of cells so they can be burned (oxidized) for energy by the mitochondria.

Mitochondria are often referred to as the "power house" of cells where energy is produced. The actual process of how carnitine shuttles fatty acids to the mitochondria is fairly complex and detailed. Suffice it to say, it involves several enzymes and steps before the fats you want to burn end up being utilized by the mitochondria. So, the carnitine shuttle system is essential for the body to be able to burn fats as energy and this is why companies sell carnitine as a "fat burner."

What does the research say?

Studies that have focused on weight loss in people using carnitine as a supplement are few and conflicting. There are far more studies that look at carnitine as a sports and energy enhancing supplement, with some studies suggesting carnitine may help endurance athletes.

In animals, some studies have found increases in the use of fat for energy with high dose carnitine supplementation, but human studies are mixed, with some showing effects on endurance while others find no effect.

The difference may be dose and or the nutritional status of the athletes being tested. Doses used are generally high, in the multi-gram range (2000

mg-5000 mg) and higher.

Carnitine does appear to have real health uses and is even listed in the Physicians Desk Reference (a.k.a. the PDR) for certain pathologies involving the heart.

Many alternative doctors swear by it for that use. Carnitine may also help reduce cholesterol and increase HDL cholesterol, the "good" cholesterol.

Acetyl-l-carnitine in particular has potential uses as an "anti-aging" supplement. A number of animal experiments have shown improvements in mitochondrial function reduced by aging. It also appears to have neuroprotective and cognitive effects. Both acetyl-l-carnitine and propionyl-l-carnitine have been used as experimental therapies for erectile dysfunction and fatigue associated with male aging.

There a couple of studies that indicate l-carnitine might have some uses for recovery. In one study, untrained subjects taking 3 g of l-carnitine/day for 3 weeks, experienced less muscle damage and pain following a session of eccentric exercise, relative to a placebo group. In the second study, recreationally weight trained men receiving 2 g of l-carnitine-l-tartrate/day for 3 weeks showed less muscle damage after performing a squat protocol (5 sets x 15 - 20 reps).

What does the real world have to say?

L-Carnitine has been disappointing as a fat loss nutrient. Acetyl-l-carnitine has a reputation as a "nootropic", and some swear by it for improving overall mood and focus. I do not know anyone who has tried carnitine as a recovery nutrient, so feedback on this use is lacking.

Recommendations:

Although it may very well have potential health benefits in certain people, carnitine's performance improving and "fat burning" abilities are questionable until more conclusive research is carried out. People who wish to try carnitine will need to use at least 500 milligrams (mg) or more several times daily, with some studies using 5 g to 6 g (5000 mg - 6000 mg) or more, daily.

Carnitine is a very safe supplement with no known toxic effects, which

"Although it may very well have potential health benefits in certain people, carnitine's performance improving and "fat burning" abilities are questionable until more research is carried out."

is why it is often found as an ingredient in weight loss formulas. People would be wise however to check the dose in such formulas as higher doses are clearly needed for any effect.

For general health and other uses, carnitine gets a thumbs up, but for building muscle it gets a thumbs down. For possibly improving endurance, it may be worth a try, albeit an expensive try if you follow the doses used in the studies.

To discuss Carnitine further, you can post in the Members' Area.

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DHEA

Return to T.O.C.

What is it?

Dehydroepiandrosterone (DHEA) is a hormone produced primarily in the adrenal glands with minor amounts produced by the testes. It is found in both men and women. DHEA is the most abundant steroid hormone in the human body, and like all steroid hormones, ultimately comes from cholesterol. Most DHEA in the body is found as DHEA-sulfate (DHEA-S). DHEA is a major precursor to other steroid hormones, which is why some companies market it as a "muscle builder."

What is it supposed to do?

DHEA is marketed as being helpful for just about every human ailment from memory loss to heart disease to immune enhancement to weight loss, and more.

What does the research have to say?

DHEA consistently makes rodents such as mice and rats lose weight. In red-eyed rodents (i.e. mice and rats), DHEA causes many biochemical changes that just don't seem to happen in people, showing just how different rats and people can be.

In people, the research has been far less impressive. Several studies using over 1500 mg per day of DHEA showed either no effects or short-lived effects on body composition in humans.

One early study found 1600 mg per day of DHEA (a very high dose of DHEA) reduced body fat and increased muscle mass in men, with later studies done by the same group and others failing to find that effect. Another study conducted in 1999 confirmed that supplementation of 150 mg/day DHEA for 8 weeks, in combination with a resistance training program had no effect on testosterone levels, strength, or lean mass in younger men. This result was echoed by a different research group, that found 100 mg/day DHEA resulted in small, non-significant increases in strength and lean mass in middle-aged, strength-training men over a 12 week period.

Some studies in people using DHEA have shown slight increases in testosterone and insulin-like growth factor 1 (IGF-1) levels, but most studies - such as the one cited above - have found minimal effect in younger people. On the other hand, older people - particularly post-menopausal women - tend to show more improvement with DHEA supplementation. One recent study found that DHEA therapy enhanced the improvements seen with strength training with older adults. The researchers concluded:

"DHEA alone for 6 mo did not significantly increase strength or thigh muscle volume. However, DHEA therapy potentiated the effect of 4 mo. of weightlifting training on muscle strength...and on thigh muscle volume...Serum insulin-like growth factor concentration increased in response to DHEA replacement. This study provides evidence that DHEA replacement has the beneficial effect of enhancing the increases in muscle mass and strength induced by heavy resistance exercise in elderly individuals."

The research showing health improvements, such as cognitive benefits, immune enhancement, stress reduction, and anti-cancer benefits, is also compelling.

What does the real world have to say?

I have known many people who genuinely felt DHEA helped them in many ways, including an improved feeling of well being, but none of them claimed to have lost any weight using it. In my personal experiences with people over the years, no one has gained muscle, increased strength, or lost measurable amounts of body fat from the use of DHEA.

Recommendations

It's well known that DHEA levels fall off as we age, and the research on health uses of DHEA justifies using small amounts to counter this age-related drop off, or deficiencies from other causes.

As a muscle building supplement in young healthy athletes, DHEA is almost certainly worthless, and high intakes may in fact be counterproductive to gaining muscle. Positive effects of DHEA in older individuals is much clearer, however, with only 25 - 100 mg per day needed to positively effect bone mineral density, lean mass, and body fat levels in older men and women.

Why the difference between old and young people?

"DHEA alone for 6 mo did not significantly increase strength or thigh muscle volume. However, DHEA therapy potentiated the effect of 4 mo of weightlifting training on muscle strength... and on thigh muscle volume...Serum insulin-like growth factor concentration increased in response to DHEA replacement. This study provides evidence that DHEA replacement has the beneficial effect of enhancing the increases in muscle mass and strength induced by heavy resistance exercise in elderly individuals."

DHEA and DHEA-S levels are one of the best biological markers of aging known. DHEA levels rise slowly till they peak at around 30 years of age, and decline steadily after age 35, with levels reduced by 70 - 80% by age 75. This effect is one of the most consistent and predictable changes in aging people known so far.

Though the utility of DHEA in younger people with normal physiological levels of DHEA is debatable, the benefits clearly outweigh any small risks in people over 40 who have reduced DHEA levels. Only blood tests will tell a person what their DHEA/DHEA-S levels are and where they are compared to others in their age group.

People interested in using DHEA as a general health benefiting supplement, should have blood tests done to determine their levels of DHEA/DHEA-S before using this supplement. For general DHEA replacement, very small amounts are needed, like 25 - 50 mg a day for men and even less for women.

As a bodybuilding supplement, it's generally been a bust. Also: though fairly safe, it's not an innocuous substance. DHEA is a steroid hormone and weak androgen. Some women have noticed increases in facial hair growth from using large amounts of DHEA.

To discuss DHEA further, you can post in the Members' Area.

Click Here

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7-Keto DHEA

Return to T.O.C.

What is it?

7-Keto DHEA is 3-Acetyl-7-oxo-dehydroepiandrosterone - a naturally occurring metabolite of the steroid precursor DHEA.

What is it supposed to do?

7-Keto DHEA can allegedly provide many of the benefits of DHEA, without the drawbacks. It's marketed primarily as a fat loss supplement.

What does the research say?

As most people know, DHEA is claimed to help just about every ailment known to man kind, from depression, to heart disease, to cancer, to weight loss.

The criticism of DHEA has been its potential effects on people's hormones, as DHEA can be converted into the sex hormones such as testosterone, estrogen, as well as others. Though research has been contradictory regarding DHEA's effects on hormones, most agree that it does have the potential for problems, if used in high enough doses.

Researchers looked into the possibility that there may be a downstream metabolite of DHEA that was responsible for many of its potentially positive effects on health without the downsides mentioned above. That metabolite appears to be 3-Acetyl-7-oxo-dehydroepiandrosterone, or simply 7-keto DHEA. 7-Keto DHEA may in fact be more biologically active, that is have enhanced effects above that of DHEA, without the ability to alter hormone levels in the body of people using it.

In vitro (test tube) studies with 7-keto DHEA appear to show it has no effects on steroid hormones and does not convert to sex hormones such as testosterone, estrogens, etc. One study that fed 200 mg of 7-keto DHEA to men aged 18 - 49 years old for four weeks found no effects on sex hormone levels. Interestingly, 7-keto DHEA may have a more pronounced thermogenic effect (the process the body uses to convert stored calories into energy) than DHEA and a few animal studies and in-vitro studies have shown

this.

However, no studies to date, in people, have looked specifically at the thermogenic effect of 7-keto DHEA vs. DHEA. Some animal research has also shown improvements in memory and other cognitive functions. 7-keto DHEA may also have positive effects on thyroid function.

One of the better known claims of DHEA is as a weight loss agent, but studies using various doses of DHEA for weight loss have been disappointing for the most part.

As for 7-Keto DHEA, there has been one recent study with people that looked at weight loss. The study fed 30 overweight women (15 acted as a control group and received a placebo) 200mg a day of 7-keto DHEA for 8 weeks.

The study participants were put on a three-day per week cross training exercise program. The study found that the group getting the 7-Keto DHEA lost 1.8 percent of its bodyweight – a little over 6 lb. on average – vs. the placebo group, that only lost 0.57 percent of its body weight.

The study also found that the group getting the 7-keto DHEA had increases in the thyroid hormone T3, without significant changes in testosterone, estradiol (estrogen), liver and kidney function tests, blood sugar vital signs, or overall caloric intake over the eight-week study.

There were no adverse effects reported throughout the study in the people getting the 7-Keto-DHEA supplement. The study concluded:

"200 mg of 7-Keto-DHEA per day yields a significant reduction in both body weight and body fat."

However, it's important to note that this is just one small human study and more research is clearly needed.

On paper, 7-keto DHEA looks promising. We do have some human research regarding weight loss, albeit only one study. The study is a compelling one however, and appears to show 7-keto DHEA has effects that are different from that of simple DHEA on weight loss, though more human studies are clearly needed.

"...200 mg of 7-Keto-DHEA per day yields significant reduction in both body weight and body fat."

What does the real world have to say?

Feedback on 7-keto DHEA alone as a fat loss agent has been lackluster. It gets more favorable notice as part of a stack.

Recommendations:

7-Keto DHEA should be a very safe supplement, though it probably will not be a supplement that improves athletic prowess. As people know, both DHEA and 7-Keto are often touted for building muscle or improving performance, but there is no data to show that with 7-keto, and data with DHEA are conflicting at best.

For general health and possibly weight loss, 7-Keto gets a tentative thumbs up, but for increasing muscle mass, strength, or performance, it gets a thumbs down (as does DHEA) at this time.

To discuss 7-Keto DHEA further, you can post in the Members' Area.

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HMB and KIC

Return to T.O.C.

What are they?

"HMB" is beta-hydroxymethylbutyric acid; "KIC" is alpha-ketoisocaproic acid. Both are metabolites of the amino acid leucine, which plays a key role in protein synthesis. L-leucine is one of three amino acids known as the branched chain amino acids or BCAA (isoleucine and valine being the other two).

KIC and HMB are intermediates in the oxidative breakdown of leucine, where it is deaminated and converted first into KIC, then into HMB. Eventually, the carbon skeleton is converted to acetyl-CoA, and enters the citric acid (Kreb's) cycle to be used for energy production.

What are they supposed to do?

As sports supplements, they're marketed as anti-catabolics. Rather than increasing LBM by enhancing protein synthesis, they work by decreasing protein breakdown.

HMB has been promoted more aggressively, and is better known than KIC.

What does the research say?

HMB appears to be one of those classic supplements that looks great in the lab but has had a rocky track record with "real world" users. Let me back up a moment.

It has been known for a long time that BCAAs play a critical role in the turn over of lean body tissues (muscle) and is muscle sparing (i.e. anti-catabolic) in a variety of muscle wasting states. Of the three BCAAs, L-leucine appears to be the most important to preserving hard earned muscle mass and intense exercise and certain disease states have been shown to eat up a great deal of L-leucine. So far so good!

The main drawback of L-leucine is the fact that you must use large amounts of this amino acid to get a positive effect, making it both expensive and impractical. Many studies that showed benefits were in fact done intrave-

nously and used as much as 5 grams per hour of L-leucine!

That, my friend, is a lot of leucine.

So, it was theorized there might be a metabolite of this ultra important amino acid that was responsible for many of the positive effects of L-leucine but could be taken in far lower doses and by mouth (as opposed to having a tube stuck in your arm). That metabolite appears to be HMB.

Animal research with HMB has been impressive. During stressful conditions, animals will often lose weight and/or become quite ill. Some even die. This of course can be quite expensive for any company trying to make a living from these animals in one way or another. When animals were fed HMB a large reduction in mortality rates, increases in muscle mass, and improvements in immune function were found.

Several studies in humans have also looked promising. Studies using both trained and untrained subjects found increases in muscle and decreases in body fat in people ingesting just three grams (3000 mg) of HMB per day.

The average was approximately 2 - 4 pounds of muscle put on with an equal amount of fat taken off over a four week period. The scientists also found that HMB positively affected several biochemical markers of intense exercise that would lead one to believe that there was a reduction of muscle wasting in people taking HMB. "So what's the problem," you ask? The problem has been mainly that what looked so promising in the research has not been fully realized in the real world, hence my introduction to this section.

Several follow up studies with HMB in people also failed to find any results.

Human research with KIC has been scanty. A recent study on glycine-arginine-alpha-ketoisocaproic acid (GAKIC) supplementation found it attenuated the decrease in mean power output between sprints in a bicycle ergometer test. Another recent study found that a 14 day preload of HMB (3 g/day) and KIC (0.3 g/day) reduced some of the symptoms of muscle damage in untrained males after a single exercise session.

These are positive results, to be sure, although hardly earth-shattering.

"'So what's the problem,' you ask? The problem has been mainly that what looked so promising in the research has not been fully realized in the real world..."

What does the real world have to say?

Feedback from real world users has been generally negative with HMB. Some seem to feel they have benefited from it, while most found HMB a big waste of money. Even fewer feel they've derived any benefit from GA-KIC, the current form of KIC on the market.

Were the studies that found benefits flawed? Are some people not taking enough? Does it depend on the nutritional status of the person using it and/or how they train?

It's not known for sure at this time, but considering the costs of HMB and GAKIC and the fact there are other less expensive alternatives that clearly work (i.e., creatine) I see no reason for hard-working athletes to spend money on these supplements until a definitive answer can be found. At this time, both get a thumbs down for building muscle, but if you want to give them a try, I will not hold it against you.

To discuss HMB or KIC further, you can post in the Members' Area.

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Phosphatidylserine

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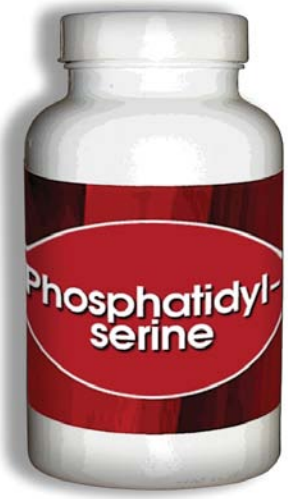

What is it?

Phosphatidylserine is a phospholipid found in cell membranes. It's composed of two fatty acids and the amino acid L-serine, linked to a glycerophosphate backbone - chemically, it's known as 1,2-diacyl-sn-glycerol-(3)-L-phosphoserine. It was first isolated from brain lipids called cephalins.

What is it supposed to do?

Supplemental phosphatidylserine may enhance cognitive function and supress cortisol production.

What does the research say?

Phosphatidylserine (PS) is a supplement that has been found to hold great promise for people suffering from various pathologies that affect the brain, such as certain forms of dementia, Alzheimer's, and others. Early European studies showed phosphatidylserine could slow and reverse the rate of brain cell aging in laboratory animals.

PS also restored mental function in older animals to levels exceeding those found in some younger animals (although studies in humans with Alzheimer's disease were less impressive, PS still produced improvements in cognitive function). Research has shown that in addition to improving neural function, PS appears to enhance energy metabolism in brain cells. In the brain, PS helps maintain cell membrane integrity and may protect brain cells against the functional deterioration that occurs with "normal" aging.

Brain tissue has been found to be especially rich in PS and it appears aging causes a decline in the PS content of cells throughout the body. So, it's no wonder that longevity groups and individuals concerned with brain function due to various causes have taken an interest in PS.

One effect of PS may be its ability to reduce levels of the catabolic (muscle wasting) hormone cortisol after exercise. Two early studies done in Italy appeared to show that chronic intakes of PS reduced the release of cortisol after intense exercise. When the body senses stress, whether physical and/

or emotional, it releases cortisol as part of the "fight or flight" cascade that prepares us for short term survival. Prolonged stress from malnutrition, surgery, overtraining and sleep deprivation, as well as psychological stress, causes a systemic effect that includes increased cortisol secretion resulting in a decline in certain aspects of the immune system and other problems.

"Prolonged stress from malnutrition, surgery, overtraining and sleep deprivation, as well as psychological stress, causes a systemic effect that includes increased cortisol secretion resulting in a decline in certain aspects of the immune system and other problems."

As the reader can see, over long periods of time, high cortisol levels are detrimental to our overall health and muscle mass. A supplement that could reduce cortisol has obvious applications for athletes.

There is one catch: PS in supplements is usually derived from soy. Most of the aforementioned studies used PS derived from bovine cortex, which is not now recommended for human consumption due to fear of contamination by the prions associated with Bovine Spongiform Encephalitis (BSE), or "Mad Cow Disease." The soy-derived PS is somewhat different than the bovine-derived version. PS from soy has mostly polyunsaturated fatty acids, whereas the fatty acids in bovine PS are a mixture of saturated and monounsaturated fatty acids, along with the essential fatty acid metabolite docosahexaenoic acid. There is some question, therefore, if soy-derived PS is as effective as the bovine version.

Several recent studies have shed some light on the subject. In one of them, 750 mg/day soy PS was found to significantly increase the time to exhaustion in a cycling trial, although two additional studies by the same group found that it did not reduce oxidative stress, markers of inflammation, muscle damage, perceived soreness, or cortisol levels following downhill or intermittent (sprint) running.

Another study, found 400 mg/day of soy PS was effective in blunting serum and salivary cortisol and emotional distress in response to psychological stress.

It's not completely clear from the above studies if soy PS is equivalent to bovine PS, although there do appear to be some potential benefits to its use.

What does the real world have to say?

Anecdotally, people who have tried PS report mild improvements to their mood. A few have mentioned that they feel able to work out longer as well. The doses most take range from 600 - 800 mg/day - few notice any

results at lower doses.

Recommendations

PS does suffer from one key drawback, which is its sheer cost. The doses used in the latest studies range from 400 - 800 mg/day, while most supplements supply no more than 100 mg/capsule. Another drawback is that PS has not been studied to see whether or not it would truly improve either strength or muscle mass in athletes, which is ultimately the bottom line for recommending a product.

At this time, PS gets a very tentative thumbs up for athletes, but again, it's far from clear what effects it will have on muscle mass or performance, or what the optimal dose is.

To discuss Phosphatidylserine further, you can post in the Members' Area.

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Ribose

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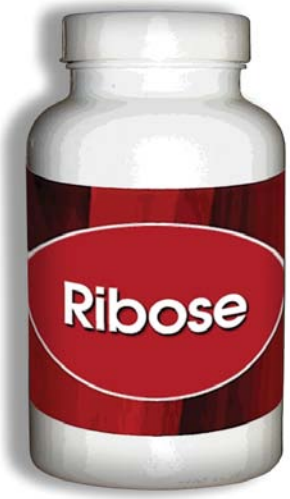

What is it?

Ribose is technically a sugar. There are many sugars the body uses for a wide variety of functions.

Most people know the sugars such as glucose, sucrose, and fructose (blood sugar, table sugar and fruit sugar, respectively). For example, glucose can be found in some fruits and is the form of sugar found in the blood stream, hence the term "blood sugar."

Sucrose is often called "table sugar" as it is the common form added to many foods and is found in the sugar bowl on your table (sucrose is actually made up of glucose and fructose).

Fructose is often referred to as "fruit sugar" because it is found as the dominant sugar in fruit. There are however many other sugars the body uses for countless functions and/or is found in the foods we eat: pentose, xylose, galactose, mannose, ribose, and many others.

Ribose is widespread among all organisms and is a constituent of ribonucleic acid (RNA) which carries our genetic code. However, ribose is involved in many other functions in the body, including the production of high energy compounds the body uses to do work (i.e. exercise, etc.).

What is it supposed to do?

Data suggest that ribose may both serve as an energy source and enhance the production of compounds known as purine nucleotides. It is well established that high energy compounds such as ATP are reduced during and after intense exercise.

What does the research say?

The body must resynthesize these high energy compounds during the post exercise recuperation phase and this is where ribose may come into play. By adding an external dietary source of ribose in high enough doses, athletes may be able to recuperate faster from intense workouts and thus

can improve performance and strength. In studies where the normal synthesis of these high energy compounds is reduced by certain diseases or genetic problems, ribose has looked promising for helping people afflicted with such problems.

However, studies looking at healthy athletes showing improvements in strength or performance give mixed results. For example, a small study with 15 male bodybuilders examined exercise performance over a four week period.

The men were given 5 g of ribose before they performed the bench press and 5 g following the exercise vs. a group taking a placebo. The study found a statistically significant increase in the number of repetitions performed in the bench press in athletes getting the ribose compared to athletes taking the placebo (5 subjects in the ribose group and 7 in the placebo group).

The number of bench press repetitions performed to muscular failure increased +29.8 percent ribose vs. +7.42 percent placebo ($p = 0.046$) over the 4 week period. Another relatively small study with 16 athletes receiving 10g of ribose and put through repeated sprints had an increase in mean power over 5 days of training (4.2 percent vs. 0.6 percent).

Findings also included greater peak power output at the last sprint session (11.4 watts/kg vs. 10.4 watts/kg, $p=0.05$ time) vs. a placebo group.

However, it's important to note that these are both small studies and neither have been published in a peer reviewed journal (see references).

On the other hand, a study on 19 trained males taking 10 g ribose/day for 5 days showed modest improvements in total work output, but no improvements in anaerobic exercise capacity or differences in lactate, ammonia, and other metabolic markers. Another study using 32 g ribose/day concluded:

"...ribose supplementation did not show reproducible increases in performance across all 6 sprints. Therefore, within the framework of this investigation, it appears that ribose supplementation does not have a consistent or substantial effect on anaerobic cycle sprinting."

In yet another study, researchers measuring the effect of 16 g ribose /day on maximal exercise and ATP recovery following a series of dynamic knee

"...ribose supplementation did not show reproducible increases in performance across all 6 sprints. Therefore, within the framework of this investigation, it appears that ribose supplementation does not have a consistent or substantial effect on anaerobic cycle sprinting."

extensions stated:

"Oral ribose supplementation with 4 g doses four times a day does not beneficially impact on postexercise muscle ATP recovery and maximal intermittent exercise performance."

"Oral ribose supplementation with 4 g doses 4 times a day does not beneficially impact on postexercise muscle ATP recovery and maximal intermittent exercise performance."

Even a longer term study on rowing performance turned up negative. Members of a collegiate rowing team took 10 g ribose for 8 weeks before and after practice, while a control group took the same amount of dextrose. At the end of 8 weeks, the dextrose group showed greater improvements in timed trials than the ribose group.

What does the real world have to say?

Ribose gets mixed reviews from people who've tried it. A few stack it with creatine and feel that there's some improvement. Others feel nothing at all.

Recommendations

Ribose is one of those supplements that look good in theory, but don't really do much in the real world. It does appear to help people with various pathologies, but there's a lack of large scale human studies that are published in peer-reviewed journals showing it will increase LBM, strength or performance. It's also fairly expensive. Overall, I have to give Ribose a thumbs down at this point: there are better ways to spend your hard earned money.

To discuss Ribose further, you can post in the Members' Area.

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Protein Powders

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Protein powders are among the most popular supplements on the market today. It isn't always easy or convenient to get the desired amount of protein from whole foods, so supplemental protein is used to fill in the blanks.

All proteins are not alike, and some possess clear advantages over others, particularly at certain times. Certain combinations might also have advantages, both for addition of LBM as well as basic health and well-being.

It's important to remember that protein powders are supplements. In other words, you use them in addition to the food in your diet - not to replace food in your diet. Protein powders typically supply very few additional nutrients besides protein. Far too many would be bodybuilders construct their diets around protein powders or other supplements, such as weight gainers and MRPs, then wonder why they're not seeing results. While there's no hard and fast rule, I recommend that you consume no more than 30% of your total protein from supplements. A fairly normal schedule might be something like: Breakfast, mid morning shake, lunch, post workout shake, snack, dinner.

Used correctly, high-quality protein powders are one of the best supplement investments you can make.

Whey Protein

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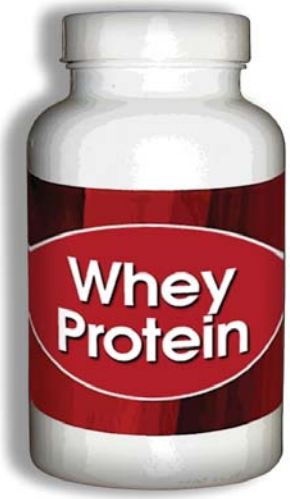

What is it?

Whey protein has become a staple supplement for most bodybuilders and other athletes and for good reason: it's a great protein for a wide variety of reasons.

Whey proteins make up approx. 20% of the protein in milk. Whey protein is actually a mixture of proteins with different biological properties. They are:

Beta-lactoglobulin (approx. 50%)
Alpha-lactalbumin (approx. 25%)
Bovine Serum Albumin
Immunoglobulins (antibodies): IgG_1, IgG_2, IgA, IgM
Glycomacropeptides
Lactoferrin
Lactoperoxidase
Lysozyme
$Beta_2$-microglobulin

What is it supposed to do?

Whey protein is an extremely high-quality source of essential amino acids that are easily digested and absorbed. But beyond its value as a source of dietary protein, it possesses a variety of potential health benefits. A growing number of studies has found whey may potentially reduce cancer rates, combat HIV, improve immunity, reduce stress and lower cortisol, increase brain serotonin levels, improve liver function in those suffering from certain forms of hepatitis, reduce blood pressure, and improve performance, to name a few of its potential medical and sports related applications.

What does the research say?

One of whey's major effects is its apparent ability to raise glutathione (GSH). The importance of GSH for the proper function of the immune system cannot be overstated. GSH is arguably the most important water-soluble antioxidant found in the body.

The concentration of intracellular GSH is directly related to lymphocytes reactivity to a challenge, which suggests intracellular GSH levels are one way to modulate immune function. GSH is a tri-peptide made up of the amino acids L-cysteine, L-glutamine and glycine. Of the three, cysteine is the main source of the free sulfhydryl group of GSH and is a limiting factor in the synthesis of GSH.

Since GSH is known to be essential to immunity, oxidative stress, general well being, and reduced levels of GSH are associated with a long list of diseases, whey has a place in anyone's nutrition program. Reduced GSH is also associated with over training syndrome (OTS) in athletes, so whey may very well have an application in preventing, or at least mitigating, OTS.

As mentioned previously, GSH is the major intracellular water-soluble antioxidant in the body, which is involved in the recycling of other antioxidants. Twenty healthy young adults (10 men, 10 women) were supplemented with either whey or casein for 3 months. The researchers looked at:

- Muscular performance (as assessed by whole leg isokinetic cycle testing)
- Lymphocyte GSH levels (as a marker of tissue GSH).

As one would expect, they found no baseline differences in peak power or work capacity between the whey and casein groups.

However, after treatment, a follow-up study on 18 subjects – 9 who received the whey and 9 who received the casein (considered a placebo in this study) – was conducted.

Both peak power and work capacity increased significantly in the whey group, with no changes found in the casein group. Lymphocyte GSH also increased by over 35 percent in the group receiving the whey with no change in the group getting casein.

The researchers concluded:

"This is the first study to demonstrate that prolonged supplementation with a product designed to augment antioxidant defenses resulted in improved volitional performance."

As mentioned, due to whey's high biological value and its other proper-

"This is the first study to demonstrate that prolonged supplementation with a product designed to augment antioxidant defenses resulted in improved volitional performance."

ties, such as a high branched chain amino acid content, etc., it has always been theorized whey should be a particularly effective protein for gaining or preserving muscle mass. This is one reason whey is the best selling protein on the market with bodybuilders.

A number of studies have now been performed that have confirmed what we already know: that whey protein - taken at the right time - can enhance lean body mass and performance.

For example, a study performed by Burke et al (2001) showed that consumption of whey protein with or without creatine, was associated with greater gains in lean mass and performance relative to controls. Tipton et al. (2004) demonstrated that whey, consumed either before or after resistance training, stimulated a positive anabolic response. Borsheim et al (2004) found that a post-workout drink of whey, carbohydrates and amino acids stimulated muscle protein synthesis to a greater extent than carbohydrate alone. Koopman et al (2005) had similar results using a post-workout beverage composed of whey protein hydrolysate, carbohdrate and leucine. Another study by Chromiak et al (2004) demonstrated greater gains in lean body mass with a post-workout recovery drink containing whey protein, amino acids, creatine and carbohdyrate vs. carbohydrate alone.

Several other studies have also shown the value of pre- and/or post-workout consumption of whey combined with casein. Kerksick et al (2006) found the greatest gains in lean mass using combination of 40 g/day whey protein + 8 g/day casein, while Hulmi et al (2005) demonstrated that consuming 25 g of combined whey and casein before training significantly increased post-workout metabolic rate.

What does the real world have to say?

Many people have found whey protein to be a useful addition to their diets. Part of the reason for this is that whey protein products have evolved over the years and are far superior to other protein supplements due to the range of biologically active fractions now available.

When we talk about whey, we are actually referring to a complex protein made up of many smaller protein subfractions such as: beta-lactoglobulin, alpha-lactalbumin, immunoglobulins (IgGs), glycomacropeptides, bovine serum albumin (BSA), as well as minor constituents, such as lactoperoxidases, lysozyme and lactoferrin.

Each of the subfractions found in whey has its own unique biological properties. Up until quite recently, separating these subfractions on a large scale was either impossible or prohibitively expensive for anything but research purposes.

"Maintaining the natural undenatured state of the protein is essential to its anti-cancer and immune stimulating activity."

Modern filtering technology has improved dramatically in the past decade, allowing companies to separate some of the highly bioactive peptides from whey, such as lactoferrin and lactoperoxidase.

Many of these subfractions are only found in very minute amounts in cow's milk, normally at less than one percent.

For example, though one of the most promising subfractions for preventing various diseases, improving immunity and overall health, lactoferrin makes up approximately 0.5 – 1 percent or less of whey protein derived from cow's milk (whereas human milk contains up to 15 percent lactoferrin).

Over the past few decades, whey protein powders have evolved through several generations. The early whey protein products contained as little as 30-40 percent protein and had high amounts of lactose, fat, and denatured proteins. They were considered "concentrates" and were used mostly by the food industry for baking and other uses.

Many whey products sold today would be considered second-generation whey protein supplements. Most second-generation formulas are a mix of whey concentrates (WPC) and whey isolates (WPIs). WPCs now contain as high as 70-80 percent protein, with small amounts of lactose and fat. They generally contain as much as 90 - 96 percent undenatured proteins. Research has found that only whey proteins in their natural, undenatured state (i.e. native conformation) have biological activity. Processing whey protein to remove the lactose, fats, etc., without losing its biological activity, takes special care by the manufacturer. The protein must be processed under low temperature and/or low acid conditions as not to "denature" the protein.

Maintaining the natural undenatured state of the proteins is essential to whey's anti-cancer and immune stimulating activity. Most second-generation whey products are mixed with an isolate (WPI) to bring up the protein content per serving. WPIs contain >90 percent protein contents with minimal lactose and virtually no fat.

Many isolates sold that are touted by supplement companies, are ion exchange isolates. This isolate is made by taking a concentrate and running it through what is called an "ion exchange" column. Proteins are selectively bound, based on their charge, while other components are removed.

Sounds pretty fancy, but there are serious drawbacks to this method. As mentioned above, whey protein is a complex mixture of different proteins that have their own unique effects on health, immunity, etc. Some of these subfractions are only found in very small amounts.

Due to the nature of the ion exchange process, the most valuable and health promoting components are selectively depleted. Though the protein content is increased, many of the most important subfractions are lost or greatly reduced. This makes ion exchange isolates a poor choice for a true third-generation whey protein supplement, though many companies still use it as their isolate source.

With the array of more recent processing techniques used to make WPI's - or pull out various subfractions - such as such ultra filtration (UF), micro filtration (MF), reverse osmosis (RO), dynamic membrane filtration (DMF), ion exchange chromatography, (IEC), electro-ultrafiltration (EU), radial flow chromatography (RFC) and nano filtration (NF), manufacturers can now make what appears to be optimal WPI's for health and disease prevention.

Low temperature microfiltration techniques now allow for the production of very high protein contents (>90 percent), the retention of important subfractions, extremely low fat and lactose contents, and virtually no denatured proteins.

As you would expect, these WPIs are more expensive than WPCs or ion exchange isolates. Another fairly new development is the ability to isolate certain bioactive subfractions on a large scale from whey proteins, such as lactoferrin or glycomacropeptide.

This was not possible to do on a large scale just a few years ago, but can be done today with modern filtering techniques employed by a small number of companies. This allows for a truly tailored protein supplement; manufacturers now have the ability to add back certain subfractions in amounts that can't be found in nature.

Take, for example, the subfraction lactoferrin. In many whey products, it is

nonexistent due to the type of processing employed. Even the best whey products contain less than 1 percent lactoferrin, and more like 0.5 percent, of this small, but important microfraction. Some companies are now able to add extra back in, to get a true "designer" protein.

Whey also has an exceptionally high biological value rating (though sellers of whey make FAR too big a deal of that fact) and an exceptionally high BCAA content (see BCAA section for more information).

Recommendations:

It should be clearly noted, however, that even if additional research does find that whey plays a direct role in helping athletes add muscle, no one has ever exploded with new muscle from the simple addition of whey to their diet, regardless of what some supplement companies would have you believe.

With that in mind, for general health and well being, whey gets a big thumbs up. For potential effects on muscle mass and performance, it gets a (very) tentative thumbs up at this time.

To discuss Whey Protein further, you can post in the Members' Area.

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Casein

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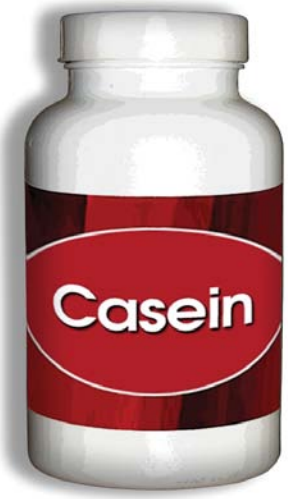

What is it?

Casein is the dominant type of protein in cow's milk, comprising 80% of the total. There are several different types of caseins: alpha(s1), alpha(s2), beta, and kappa. These associate together to form large, complex structures known as micelles. Casein micelles are huge and vary in size, but have an average molecular weight of 2.8×10^8.

What is it supposed to do?

Casein is used primarily as an anti-catabolic - that is, a protein to help limit muscle breakdown.

What does the research say?

Casein has been making inroads with bodybuilders for a variety of reasons; some scientific in nature and some based on over-hyped marketing by supplement companies looking to sell an alternative to the over saturated whey market.

Unlike whey, where there has been quite a bit of research showing the undenatured forms are the most biologically active, there is little research to show either form of casein is superior to the other, regarding effects on muscle mass or other issues that relate to athletes. People should not be overly swayed by ads from supplement companies claiming one form has been "proven" superior over another at this time.

However, since many of the recent studies have used the micellar form - and it's logical to think the human body prefers the native form - we will assume for now (and assuming is a very dangerous thing to do in the world of science) that micellar casein is the superior form of casein.

More research is clearly needed however.

One study in particular called "Slow and fast dietary proteins differently modulate postprandial protein accretion" was responsible for causing a resurgence of interest in casein and led to a great deal of misinformation,

disinformation, and downright fabrication, by supplement companies and pretend experts looking to either sell casein or bash it to protect their own sale of whey.

The truth behind the study that caused all the excitement was damn near impossible to find…until now. The basic premise of this much touted study was that the speed of absorption of dietary amino acids (from ingested proteins) varies according to the type of dietary protein a person eats. The researchers wanted to see if the type of protein eaten would affect postprandial (e.g., after a meal) protein synthesis, breakdown, and deposition. To test the hypothesis, they fed casein (CAS) and whey protein (WP) to a group of healthy adults who had been fasted.

"...the speed of protein digestion and amino acid absorption from the gut has a major effect on whole body protein anabolism after one single meal..."

Here is what they found:

- WP induced a dramatic but short increase of plasma amino acids.
- CAS induced a prolonged plateau of moderate increase in amino acids (hyperaminoacidemia)
- Whole body protein breakdown was inhibited by 34% after CAS ingestion but not after WP ingestion.
- Postprandial protein synthesis was stimulated by 68% with the WP meal and to a lesser extent (+31%) with the CAS meal.

There was of course far more detailed findings (relating mostly to postprandial whole body leucine oxidation rates, etc.) which I wont go into as it's not really needed for this section.

The researchers of this study concluded:

"...the speed of protein digestion and amino acid absorption from the gut has a major effect on whole body protein anabolism after one single meal…"

Basically the study found that CAS was good at preventing protein breakdown (proteolysis) but not so good for increasing protein synthesis and WP had basically the opposite effects: it increased protein synthesis but didn't prevent protein breakdown.

The reason for this is that whey is absorbed rapidly (being a highly soluble

protein) and much of it is oxidized while casein forms a "clot" in the gut and is absorbed slowly (being a fairly insoluble protein), thus causing a steady level of amino acids. That's why they dubbed whey a "fast" protein and casein a "slow" protein. So far so good right?

So what can we conclude from this study and how useful are the results? Like so many studies, the results were interesting and the results were of little use to people in the real world. Why? Because the subjects were fasted (had not eaten for a long period of time) which of course does not reflect how people-–especially bodybuilders and other athletes-– actually eat. Do these results hold up under more "real world" conditions where people are eating every few hours and/or mixing the proteins with other macro nutrients (i.e., carbs and fats)?

The answer is probably not, which is exactly what the same researchers found when they attempted to mimic a more realistic eating pattern. Their follow up study was called "The digestion rate of protein is an independent regulating factor of postprandial protein retention." Four groups of five to six healthy young men received:

- a single meal of slowly digested casein (CAS).
- a single meal of free amino acid mimicking casein composition (AA).
- a single meal of rapidly digested whey proteins (WP).
- or repeated meals of whey proteins (RPT-WP) mimicking slow digestion rate (i.e., reflecting how people really eat).

So what did they find?

In a nut shell, giving people multiple doses of whey – which mimics how people really eat – had basically the same effects as a single dose of casein, and mixing either with fats and proteins pretty much nullified any big differences between the two proteins. All I can say to that is (drum roll)…no duh! Their more technical conclusion was:

"The fast meals induced a strong, rapid, and transient increase of aminoacidemia, leucine flux, and oxidation. After slow meals, these parameters increased moderately but durably. Postprandial leucine balance over 7 h was higher after the slow than after the fast meals (CAS: 38 +/- 13 vs. AA: -12 +/- 11, P < 0.01; RPT-WP: 87 +/- 25 vs. WP: 6 +/- 19 micromol/kg, P < 0.05). Protein digestion rate is an independent factor modulating postprandial protein deposition."

"The fast meals induced a strong, rapid, and transient increase of aminoacidemia, leucine flux, and oxidation After slow meals, these parameters increased moderately but durably. Postprandial leucine balance over 7 h was higher after the slow than after the fast meals (CAS: 38+/- 13 vs. AA: 12+/- 11, P<0.01; RPT-WP:87 +/- 25 vs. WP: 6 +/- 19 micromol/kg, P<0.05). Protein digestion rate is an independent factor modulating postprandial protein

However, even that is not the end of the story as multiple follow up studies done by the same group and others found that these effects could even be different in older versus younger people and male versus female! How messed up is that?!

OK, can we confuse the issue some more? Yup.

A study called "Effect of a hypocaloric diet, increased protein intake and resistance training on lean mass gains and fat mass loss in overweight police officers" found some interesting and seemingly conflicting results to the studies outlined above.

This study looked at the effects of a moderate hypocaloric (low calorie) high-protein diet and resistance training, using whey or casein, versus the diet alone on body composition. A randomized, prospective 12-week study was performed comparing the changes in body composition produced by three different treatment modalities in three study groups.

- One group (n = 10) was placed on a nonlipogenic, hypocaloric diet alone (80% of predicted needs).
- A second group (n = 14) was placed on the hypocaloric diet plus resistance exercise plus a high-protein intake (1.5 g/kg/day) using a casein protein hydrolysate.
- The third group (n = 14) treatment was identical to the second, except for the use of a whey protein hydrolysate.

The study found that weight loss was approximately the same in all three groups with each losing approximately 2.5 kgs.

However, the actual fat loss and changes in LBM between groups were quite different. The mean fat loss was 2.5, 7.0, and 4.2 kg in the three groups, respectively, so the casein group lost more fat. As expected, increases in LBM in the three groups did not change for diet alone, versus gains of 4 and 2 kg in the casein and whey groups, respectively.

Translated, the casein group lost more fat and added more LBM then the whey group or the non-supplemented non-exercising group. This translated into greater strength increases for the casein group then for the whey group (mean increase in strength for chest, shoulder and legs was approxi-

"This significant difference in body composition and strength is likely due to improved nitrogen retention and overall anti-catabolic effects caused by the peptide components of the casein hydrolysate."

mately 59% for casein and approximately 29% for whey, a significant group to group difference).

The researchers concluded "This significant difference in body composition and strength is likely due to improved nitrogen retention and overall anti-catabolic effects caused by the peptide components of the casein hydrolysate."

What does the real world have to say?

Bodybuilders have taken to the idea of using casein as a "bedtime snack" to limit muscle protein breakdown during sleep. Many also use it - alone or combined with whey - for general protein supplementation during the day. Most seem to feel that it's a worthwhile addition, although it's impossible to assess what effect it has on adding LBM.

Recommendations:

So where does all this leave us? From the research we have to go on and applying it to the real world, there are some basic conclusions we come to regarding casein and the issue of casein versus whey:

- Nature combines the two for a reason as both proteins have some unique effects.

- If one is eating as they should for increases in LBM as outlined in the e-book, there is probably no effective differences between the two proteins. Mixing the proteins with fats and carbs will also alter the effects on the rate of absorption.

- Whey is probably superior post workout when a fast absorption of protein is warranted.

- Casein is probably best used when there will be prolonged periods of time without eating, in particular, during sleep. 30 - 50 g of casein before bed may have anti-catabolic benefits.

- MRPs (i.e., products that attempt to replace a meal like LeanBody, MetRX, etc) are probably most effective when they combine whey and casein as nature does. Cow's milk is approximately 80% casein and 20% whey. Human mothers milk is closer to a 50/50 split, so anything be-

tween those two is probably optimal for a commercial or homemade MRP.

- During reduced calories (e.g., diets for losing fat) casein may be the better protein for preventing a loss of LBM due to its slow absorption/anti-catabolic effects. Combing the two in a 80/20 to 50/50 split of casein to whey may be optimal (though more data is CLEARLY needed!).

Bottom line: in my view, whey can do so many things that casein simply can't do (see whey section), so I would not recommend people switch from whey to casein exclusively. I would however recommend that people consider using the two proteins strategically as outlined above. The benefits of the two proteins appear to be in the timing of both.

To discuss Casein further, you can post in the Members' Area.

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"In my view, whey can do so many things that casein simply can't do (see whey section), so I would not recommend people switch from whey to casein exclusively. I would however recommend that people consider using the two proteins strategically as outlined above. The benefits of the two proteins appear to be in the timing of both."

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Colostrum

Return to T.O.C.

What is it?

Colostrum – also called foremilk – is a thin, yellowish fluid secreted by the mammary glands of mammals in the very first week of lactation. It's rich in immunoglobulins, anti-microbial peptides, minerals and multitude of growth factors conferred to the infant (in humans) or calf (in cows and other animals).

What is it supposed to do?

Colostrum is rich in growth factors, including IGF-1. Some studies have shown colostrum supplements increase IGF-1, and have a positive influence on lean body mass and/or athletic performance.

What does the research say?

From a medical standpoint, properly made colostrum looks promising for diseases that affect the gastrointestinal (GI) tract. Several studies have confirmed colostrum's potential to protect against and treat GI infections.

One study that found colostrum increased the salivary Insulin Like Growth Factor one (IGF-1) levels of athletes. Nine male sprinters were fed a colostrum product for 8 days.

The study found statistically significant changes in the IGF-1 levels of the athletes tested via saliva testing. At one point, it was thought that this result showed that the long-held belief that IGF-1 was degraded in the digestive tract might be wrong. A follow up study by the same research group, however, concluded:

"...a long-term supplementation of bovine colostrum (Dynamic) increases serum IGF-I and saliva IgA concentration in athletes during training. Absorption data show that ingested 123I-rhIGF-I is fragmented in circulation and that no radioactive IGF-I is eluted at the positions of free, or the IGF, binding proteins, giving no support to the absorption of IGF-I from bovine colostrum."

The researchers did find a 17% increase in serum IGF-1 with 20 g/day co-

lostrum supplementation, but speculated the increase might be due to enhanced stimulation of IGF-1 synthesis.

The results from different studies of the effects of colostrum supplementation on lean body mass and performance are conflicting. One study presented by Dr. Richard Kreider and co-workers at the 2001 Experimental Biology conference found the addition of colostrum to the diets of 49 well trained athletes increased both body weight and bench press strength. A study conducted by Dr. Jose Antonio found a mean increase of 1.49 kg of lean body mass after 8 weeks of supplementing with 20 g/day colostrum. Small, but significant improvements in cycling, jumping and sprint performance have also been demonstrated.

On the other hand, 60 g/day colostrum did not improve the performance of elite female rowers, while 20 g/day had no effect on strength performance or net protein balance.

In addition, two of the studies that showed positive effects on performance showed no increases in serum IGF-1.

What does the real world have to say?

I haven't heard much - either positive or negative - about colostrum supplementation. Very few people use it at the doses seen in the studies due to the expense; and the smaller doses found in capsule formulations are highly unlikely to have any significant effects on LBM or performance. Colostrum is included as an ingredient in several popular protein powders, but appears to be mostly label decoration.

Recommendations:

Should athletes run out and buy colostrum? Possibly not; some of the above studies were small; while most of the ones showing positive effects on performance resulted in fairly modest improvements. Conflicting results make it difficult to come to any firm conclusions.

Part of the problem may lie in the differences between products. There is no standard for the composition of colostrum, which can vary considerably based on the health of the cows, feed composition, collection times, and processing. Collection time is a significant issue: colostrum is defined as the milk collected up to 4 days following calving. Nonetheless, the co-

"...a long-term supplementation of bovine colostrum (Dynamic) increases serum IGF-I and saliva IgA concentration in athletes during training. Absorption data show that ingested 123I-rhIGF-I is fragmented in circulation and that no radioactive IGF-I is eluted at the positions of free, or the IGF, binding proteins, giving no support to the absorption of IGF-I from bovine colostrum."

lostrum collected within the first 24 hours is far richer in immunoglobulins than the colostrum collected at later intervals. This may also be true for other growth factors as well.

However, it appears that newer versions of colostrum may, in fact, have benefit to athletes and appear to have clear uses in certain medical conditions.

How much benefit and at what dosage have yet to be determined. I think colostrum is worth keeping an eye on and maybe useful for various pathologies of the digestive tract. In my view, it might be worth a try just for the heck of it, although it's a fairly expensive supplement. Optimal doses are unknown at this time, although 20 g/day is the one most commonly seen in the studies.

To discuss Colostrum further, you can post in the Members' Area.

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Egg White Protein

Return to T.O.C.

What is it?

Eggs - in particular egg whites - have been a staple protein source for bodybuilders and other athletes for decades. Egg white, or albumen, is composed of several different proteins:

- ovalbumin (54%)
- conalbumin (13%)
- ovomucoid (11%)
- globulins (8%)
- lysozyme (3.5%)
- ovomucin (1.5%)
- other proteins present at <1%: flavoprotein, ovoglycoprotein, ovomacroglobulin, ovoinhibitor and avidin

Supplemental egg white protein is sold as a spray-dried powder, or in liquid, pasteurized form.

What is it supposed to do?

Egg white protein is a virtually fat-free, low-calorie source of protein. While egg white proteins are not - as far as is currently known - a source of bioactive peptides (such as whey, etc.), they can be used to increase the overall protein content of the diet.

What does the research say?

Beyond serving as a source of protein, there is little that's special about egg whites. Substituting egg white protein in the diets of hypercholesterolemic women had beneficial effects on serum lipids. Egg white is also relatively high in BCAAs, so can be used in addition to other protein supplements such as whey as a source of these critical amino acids.

There is a myth, pushed by various "raw food" fanatics, that eating denatured proteins is somehow harmful and/or unhealthful. While most people wouldn't eat raw meat, they nonetheless will consume raw eggs, in the belief that cooking "destroys" the protein, or makes it less digestible.

But the precise opposite is true for egg whites. Research has shown that raw egg whites, in fact, are much more poorly absorbed than cooked ones. In two separate studies, raw egg whites consumed by human volunteers were 35% - 50% undigested and absorbed, whereas only 5% - 9% of cooked egg whites were not assimilated.

The liquid egg whites sold refrigerated have been pasteurized. I've been asked if these whites are more digestible than fresh, raw whites. They probably are, but I doubt that they are as digestible as completely cooked whites.

What does the real world have to say?

Many bodybuilders supplement their protein intake with egg whites: both cooked or blended with other proteins in a shake. It's a simple and convenient way to add extra protein, which is why it's such a common practice.

Recommendations:

It should be emphasized that egg whites aren't good for much else besides protein. Most of the egg nutrients are contained in the yolk. So while egg whites can be used to boost the protein content of a meal, they shouldn't be used to replace more nutritious sources.

Another point of contention regarding egg whites is people are under the impression (often due to misleading marketing by companies selling egg white protein) that egg whites are some sort of super protein. It should be noted the high score eggs have is based on the whole egg only. For example, whole eggs score 100 on the biological value (BV) protein scoring system. Egg whites have a BV score of 88. 88 is not a low quality protein per se, but it's not the BV of 100 whole eggs enjoy. Will this have any negative effects on your ability to gain LBM? Unlikely, but when ever you see companies calling their egg white protein product "natures perfect food" or "the gold standard protein" and other over hyped nonsense, remember it's whole eggs and not egg whites they are actually referring to.

To discuss Egg White Protein further, you can post in the Members' Area.

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"It should be noted that the high score eggs have is based on the whole egg only...Egg whites have a BV score of 88. 88 is not a low quality protein per se, but it's not the BV of 100 whole eggs enjoy."

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Serum Protein Isolate

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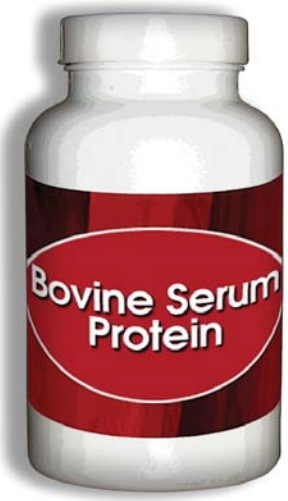

What is it?

Serum protein isolate is one of the newer protein supplements to hit the market. It's derived from bovine blood serum or plasma. Plasma is the clear, straw-colored fluid remaining when the blood cells are removed - typically by centrifugation. Serum is the same, except the blood is allowed to clot before removing the fluid.

The major plasma proteins are: albumin, immunoglobulins (IgG, IgA, IgD, IgE, IgM), transferrin, and fibrinogen. There are also a large number of minor constituents: enzymes and various peptide and polypeptide growth factors, including IGF-1.

Serum protein isolate is being marketed primarily by Proliant, Inc. as "Immunolin." Proliant uses a proprietary manufacturing process, so the precise proportions of each component in Immunolin isn't public information.

Proliant also claims that Immunolin is BSE free. BSE is bovine spongiform encephalopathy, an infectious disease that causes progressive - and eventually fatal - neurodegeneration. Also known as "Mad Cow Disease", it can be passed to humans through contaminated meat and byproducts.

What is it supposed to do?

Proliant claims that the benefits of serum protein isolate are similar to those of colostrum. It's supposed to be a "value added" supplement that provides both high quality protein and immune enhancement.

What does the research say?

There is very little direct research on the value of serum/plasma protein in human nutrition. In one small study on the recovery of 10 Peruvian children suffering from severe protein-calorie malnutrition, bovine serum concentrate was used to replace either 25% or 50% of the milk protein in a control diet. The diet was well tolerated and no adverse effects were reported.

The lack of human data is balanced by a large number of animal feeding

studies, most of which were conducted on weanling pigs. In nearly all of the studies reviewed, spray-dried plasma (either porcine or unspecified "animal" plasma) has been an effective feed amendment, that has had positive effects on both immune status and growth.

In one study, piglets weaned at 21 days of age were fed a diet containing 6% spray-dried animal plasma had improved growth and reduced inflammation following a challenge with enterotoxigenic E. coli K88. Similar effects were also seen in a study on the performance of early (10 day) weaned piglets challenged with E. coli strain F18.

Studies conducted in the absence of an immunological challenge have shown that adding spray-dried plasma to piglet feed increases weight gain and nitrogen retention. Most of these studies agree, however, that the increase in growth is due primarily to increased feed intake: piglets display a clear preference for plasma-enriched feed. Furthermore, in one Proliant-sponsored study, the actual percentage of fat vs. fat-free tissue was unchanged vs. controls. Thus plasma feeding leads to bigger, but not necessarily leaner, pigs. Researchers have also noted that supplemental methionine is needed when the plasma content of the diet exceeds 6%.

Spray-dried plasma contains a number of growth factors, including IGF-1. The piglet studies demonstrate, however, that consuming spray-dried plasma does not increase levels of plasma IGF-1. This is in accord with a study demonstrating that oral IGF-1 in humans is broken down in the digestive tract.

This does not exclude the possibility of local effects of IGF-1 in the gut. There are IGF-1 receptors in the small intestine, and it's thought that IGF-1 along other growth factors such as EGF (epidermal growth factor) and TGF-α/TGF-β (transforming growth factor) play a role in the development of the small intestine in breast-fed human infants. There is no indication, however, that this leads to skeletal muscle growth.

Several studies have demonstrated that oral administration of hyperimmune globulin (i.e., immunoglobulin preparations from specifically immunized animals) is a useful therapy for gastrointestinal infections, such as rotavirus and shigella. So it's possible that consumption of non-denatured immunoglobulins in bovine serum protein could have a protective effect against certain GI infections. This hasn't been demonstrated for Immunolin, however. It's also possible that the effects of consuming bovine serum

protein will be similar to colostrum, although this hasn't been proven either.

What does the real world have to say?

Immunolin is a fairly new supplement, and isn't cheap. There are at least a dozen brands using it on the market now, although most of them are protein blends. In general, the feedback I've seen on these products is good, although in line with most other well-made protein powders that don't contain Immunolin. Many users are a bit surprised to find out that what they are actually eating is spray dried blood!

Recommendations:

Some of the ads I've seen for bovine serum protein claim that it's the "first protein to out-date whey protein." Needless to state, there's no data to support such a claim. There's very little information to support any improvements in lean mass, body composition or performance vs. whey or any other protein source, for that matter. Until there are some solid head-to-head studies on this new supplement vs. whey, the companies selling this stuff with claims of it being superior to whey, are blowing hot marketing air. The companies selling it are also going to great lengths to disguise the source of its production: cow's blood. Though very unscientific of me, I find this product has a high "yuk factor" but that's just me…

I'd put this protein in the same category as colostrum: perhaps worth a try, although it's far from clear that the benefits are worth the extra price.

To discuss Bovine Serum Protein further, you can post in the Members' Area.

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"Until there are some solid head-to-head studies on this new supplement vs. whey, the companies selling this stuff with claims of it being superior to whey are blowing hot marketing air."

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Vegetarian Proteins: Soy, Hemp, Rice

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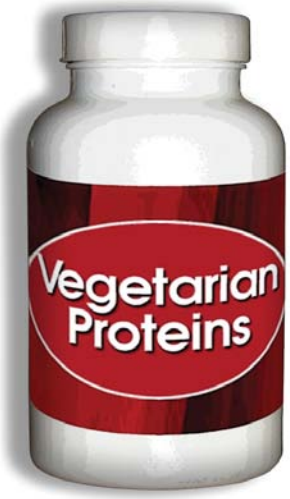

What are they?

Soy protein isolate, hemp protein, and brown rice protein concentrate are all plant-based protein powders.

What are they supposed to do?

People who are vegans or have allergies to milk and/or egg proteins prefer these protein supplements. Soy protein is also marketed heavily to women, due to its phytoestrogen content.

What does the research say?

Soy protein isolate:

The pluses and minuses of soy protein are covered in detail in my article, "The (Partial) Vindication of Soy Protein" on the Brinkzone.

Read "The (Partial) Vindication of Soy Protein:

Click Here

In brief, soy protein isolates have some interesting benefits: soy has been shown to reduce cholesterol, improve cardiovascular health and possibly increase thyroid output.

In addition to the above benefits, more recent research has shown that soy protein intake can increase antioxidant levels and reduce oxidation of LDL-cholesterol.

The drawbacks are equally well-known. The biggest one is that soy protein has a lower biological value than animal proteins such as whey or egg. Proponents of soy protein frequently point to a newer measure of protein quality: the PDCAAS (Protein Digestibility Corrected Amino Acid Score), and insist that soy rates just as high as these animal proteins - all have the same, perfect 1.00 (100%) rating. What they neglect to mention, however, is that the PDCAAS - which is used by the World Health Organization for

rating the adequacy of protein sources for malnourished children in developing countries - is arbitrarily cut off at 1.00. Whey and egg proteins actually score higher, but the excess is not reported. The actual PDCAAS for whey is 1.14, whereas the best score I've seen reported for a soy protein isolate is a true 1.00.

I would never argue that high quality, methionine-fortified isolates aren't adequate for enriching the diets of malnourished children, or are otherwise inadequate for basic growth and development...but I would argue that they're sub-optimal compared to a protein like whey for supplementing a bodybuilding diet.

"I would never argue that high-quality, methionine-fortified isolates aren't adequate for enriching the diets of malnourished children, or are otherwise inadequate for basic growth and development...but I would argue that they're sub-optimal compared to a protein like whey for supplementing a bodybuilding diet."

Hemp Protein:

Hemp is the common term for Cannabis sativa, also known as marijuana. But long before it was used to get high, Cannabis was a source of both fiber for fabric and rope, as well as oil seeds for food. The hemp currently being cultivated has been bred to have a negligible amount of the psychoactive compound THC found in marijuana.

Hemp seeds are quite nutritious. Hemp seeds are 34.6% protein, and 46.5% fat. They are high in fiber and contain the omega-3 essential fatty acid alpha-linolenic acid, along with the omega-6 gamma-linolenic acid.

The hemp protein currently sold in health food stores is derived from the seed cake left over after pressing the oil. The protein contains about 35% - 45% protein, along with a residual amount of oil. The protein is also high in chlorophyll and other nutrients associated with the seeds (vitamin E, magnesium and zinc).

There are very few studies on the consumption of hemp foods. One feeding study on hens showed no adverse effects on egg production, feed consumption, feed efficiency, body weight change or egg quality. Human studies have been confined to evaluating whether or not consumption of hemp foods could result in false positive drug tests (they don't).

On the negative side, it's unlike other protein powders: it's not highly processed or refined, so has a gritty, grassy taste. Due to the oil content, it also needs to be kept refrigerated.

Brown Rice Protein Concentrate:

Brown rice protein concentrate is a non-allergenic alternative to soy protein isolate. Oryzatein™ is a version recently introduced to the market. According to the manufacturer, Axiom Foods, Oryzatein™ has an absorption ratio (AR) of 98.6%, a, biological value (BV) of 77%,, a Protein Efficiency Ratio (PER) of 2.75, a Protein Digestibility-Corrected Amino Acid Scoring (PDCAAS) of 1.00, and a net protein utilization (NPU) of 75.92 in growing rats. If true, it's at least equivalent to, and perhaps a bit better than soy protein. The company also claims that Oryzatein™ has an amino acid profile "...with an approx. 98% correlation to mother's milk and an approx. 97% correlation to whey." Since the actual amino acid profile of the product has not been made available, the truth of this claim remains to be seen.

There are other concentrates on the market that range from 50 - 80% protein.

Feeding studies on rice protein concentrate are also limited. One study in piglets, however, rated rice protein concentrate favorably as a protein source. It did not score as high in amino acid or ileal digestion as the animal protein sources tested (whey protein concentrate, spray-dried plasma, and salmon protein hydrolysate), but still gave good results.

What does the real world have to say?

For vegans or people with milk/egg protein allergies, soy, hemp and rice proteins offer alternatives that most users appear to be happy with. Many non-vegetarians also find that supplementing with plant proteins (esp. soy and hemp) have health uses beyond the addition of protein.

Recommendations:

As noted in my Brinkzone article, supplementing with some soy protein isolate can be useful, even for non-vegetarian bodybuilders. As long as you don't mind the taste/texture/color, hemp protein can also provide some benefits. Rice protein appears to be a decent alternative for people with allergies who want to use a protein supplement. But unless you are a vegan, or have health problems that restrict the use of milk or egg proteins, I would not substitute any of these for much more anabolic animal proteins.

To discuss Soy Protein further, you can post in the Members' Area.

Click Here

To discuss Hemp Protein further, you can post in the Members' Area.

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To discuss Brown Rice Protein further, you can post in the Members' Area.

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Essential Elements

Return to T.O.C.

Essential elements are nutrients we need to get in our diet: vitamins, minerals and essential fatty acids.

Vitamins are organic compounds that play a wide variety of important roles in metabolism. The most important role vitamins play is as co-factors for various enzyme reactions. Most of the compounds identified as vitamins need to be obtained from food - our bodies cannot synthesize them. A failure to obtain adequate amounts of one or more vitamins results in deficiency diseases. Several well-known deficiency diseases include Scurvy (deficiency of vitamin C) and Beriberi (deficiency of thiamin - or vitamin B_1).

Vitamins are classified as either water soluble or fat soluble. In general, water-soluble vitamins are readily excreted, so it's hard to consume toxic amounts. Fat soluble vitamins, on the other hand, can be stored in the body, and long term overconsumption of certain ones (e.g., vitamin A and vitamin D) can lead to symptoms of toxicity.

There are 13 vitamins that are considered to be essential to human nutrition: thiamin (B_1), riboflavin (B_2), niacin/niacinamide (B_3), pantothenic acid (B_5), pyridoxal/pyridoxamine/pyridoxine (B_6), cobalamin (B_{12}), biotin, folic acid, ascorbic acid (vitamin C), retinol/retinal/retinoic acid (vitamin A), calcitriol (the active form of vitamin D), tocopherols/tocotrienols (members of the vitamin E family), and menaquinone (the active form of vitamin K).

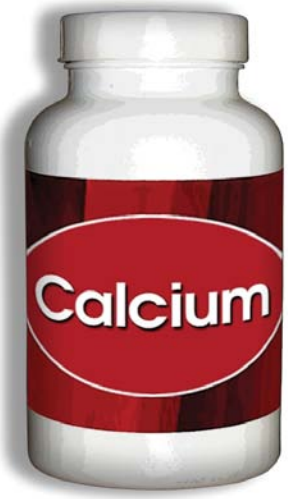
Minerals likewise perform essential functions. These are subdivided into two groups: major minerals and trace minerals. Major minerals are: sodium, potassium, calcium, phosphorus, magnesium, chloride and sulfur. Trace minerals are: iron, zinc, manganese, fluoride, iodine, selenium, copper, molybdenum, and chromium.

Major minerals are required in amounts greater than 100 mg/day. We need less of the trace minerals - some are needed in only microgram amounts (1 mcg = one-millionth of a gram).

Essential fatty acids have already been touched on in Chapter 1. More details will follow in this section.

Calcium

Return to T.O.C.



What is it?

Calcium is an essential mineral found in dairy foods, certain vegetables, tofu and in functional foods such as orange juice. There are also a variety of calcium supplements available. The most common supplemental forms are calcium carbonate, calcium phosphate, and calcium citrate.

What is it supposed to do?

As most people are well aware, calcium is a mineral needed for healthy strong bones. What many people may be unaware of is calcium's essential role in hundreds of other bodily processes from nerve transmission to enzyme activation and the functioning of muscle tissue.

Calcium works in conjunction with other minerals such as potassium and sodium to allow muscles to contract as well as keep blood in the proper pH. Without calcium, you would not even be able to lift your head up much less lift a weight.

What does the research say?

Special pumps change the concentration of calcium, sodium, and potassium ions (known as Ca^{2+}, Na^{+}, and K^{+} respectively) in different compartments of muscle tissue to make it contract (generate force) and relax. To get slightly technical: at the level of the muscle cell, ATP is used up quickly in an attempt to satisfy energy requirements.

As by-products of exercise build up, the delicate balance between Na+/ K^{+}, Ca^{2+} is disturbed, it is believed, resulting in fatigue. Ionic regulation is critical to muscle contraction and metabolism, needed for optimal muscle function during exercise.

Training enhances K^{+} regulation in muscle and blood and reduces the rate of fatigue. Both endurance and strength training induces an increased muscle Na^{+}, K^{+} pump concentration, usually associated with a reduced rise in plasma [K^{+}] during exercise. Although impaired muscle Ca^{2+} regulation plays a vital role in fatigue, less is known about its actual effects on train-

ing.

Ok, enough technical talk.

There are other things that take place both inside and outside the muscle that add to fatigue, but that's for another place and time as the explanation would be bor---, overly detailed. Interestingly, it has been found that athletes increase their rate of calcium loss in sweat from prolonged endurance sports, and increase their loss in urine after intense weight training.

There is some evidence to suggest that dairy calcium may be useful for helping to lose excess fat, but this has been questioned by other studies.

What does the real world have to say?

I have yet to see anyone who added muscle, enhanced their strength, or improved their body composition simply by increasing their intake of calcium.

Recommendations

It's well-established that most Americans fail to get even minimum intakes of calcium in their diet. Most athletes should be getting at least 1000 mg per day of calcium from food and/or supplemental sources, with female athletes needing even more.

Athletes should attempt to pay special attention to their calcium intakes and make sure to eat foods such as dairy products, leafy greens, cabbage, legumes and dairy-based protein supplements. For example, there are many forms of well-made whey proteins (i.e. concentrates, isolates, ion exchange, etc) that contain high amounts of calcium.

One 20g scoop of whey can have as much as 120-150 mg of highly bioavailable calcium per serving. Micellar casein/caseinates are also a good source and can provide a third of the DRI (daily recommended intake) per scoop.

Calcium gets a thumbs up for general health and possibly performance, but no solid data exists showing calcium has ergogenic effects above and beyond amounts needed for general health.

"Most athletes should be getting at least 1000 mg per day of calcium from food and/or supplemental sources, with female athletes needing even more."

To discuss Calcium further, you can post in the Members' Area.

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Chromium Picolinate

Return to T.O.C.

What is it?

Chromium is a trace mineral that's essential for human health. Picolinic acid is an isomer of nicotinic acid (niacin) and is a chelating agent that enhances bioavailability.

What is it supposed to do?

Chromium picolinate is often found in OTC diet supplements as an aid to reduce body fat. Some writers also insist that it can increase muscle mass and athletic performance.

What does the research say?

Of all the nutrients that are sold for weight loss and increases in muscle mass, I can't think of a nutrient that has had a rockier track record in the research than chromium picolinate (CP).

Traditionally, sellers of CP tend to pay attention only to the research that showed this popular supplement could help with fat loss while increasing lean body mass (LBM).

The truth be known (which is the purpose of this section!), CP has had quite a checkered past as it relates to the effects of CP on body fat, muscle mass, and performance in different groups of people. Early research gave glowing reports of CP and showed significant reductions in body fat, with increases in muscle in college age athletes given CP supplements.

However, as recently as 1987, no less than six studies showed CP supplementation - using various populations of people ranging from the old to the young who took various doses of CP - found no effects on muscle mass or body fat. In fact, one study found that older women (age range 54-71) given high doses of CP and put on a strength training regimen gained less muscle than the group that did not receive the supplement!

On the flip side, a more recent study looks very promising for CP as a weight loss aid. A double blind placebo controlled study of 122 over weight peo-

ple, given 400 mcg of CP for 90 days, lost over six pounds of body fat which was almost twice what the placebo group lost in body fat.

What does the real world have to say?

Chromium picolinate is one of those supplements that look good on paper, but has been unimpressive in the real world. I have not seen anyone lose weight or improve their body composition due to the simple addition of chromium to their diet.

Recommendations:

So how do we come to grips with all the conflicting research on chromium picolinate as a product used for weight loss and increase in muscle?

It is well known that diets high in sugar, exercise and other factors drain the body's stores of chromium. It is also fairly well established that a large proportion of Americans do not take in sufficient amounts of chromium in their diets and we know that much of the foods people eat have been stripped of their chromium due to modern processing techniques.

Understandably, some research shows that a large proportion of people are chromium deficient. Finally, it is well established that chromium is an essential nutrient to human health and is critical for the regulation of proper blood sugar metabolism.

So, chromium is a nutrient that we should strive to get from a good supplement and from our food. For there is no doubt that people deficient in chromium will get positive effects from consuming more of it.

Whether people who are not deficient in chromium will get any effect from additional chromium is questionable. So, make sure to get sufficient chromium in your diet from a variety of sources (i.e., multi-vitamins, whole grains, etc.), remembering, that to view any chromium supplement as a miracle fat loss supplement or muscle building/ergogenic sports aid would be premature at best.

For general health, CP gets a thumbs up, but for gaining muscle or increasing performance, it gets a thumbs down.

"So chromium is a nutrient that we should strive to get from a good supplement and our food. For there is no doubt that people deficient in chromium will get positive effects from consuming more of it."

To discuss Chromium Picolinate further, you can post in the Members' Area.

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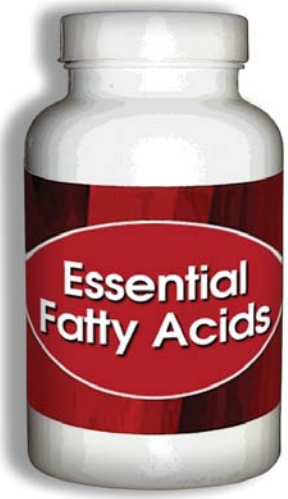
Essential Fatty Acids

Return to T.O.C.



What are they?

As discussed in Chapter 1, the two essential fatty acids we need in our diets are linoleic acid (LA) which is an omega-6 fatty acid and alpha-linolenic acid (ALA) which is an omega-3 fatty acid. The highest known source of the omega-3 fatty acid ALA is flax oil which also contains a small amount of LA (flax oil has 4 : 1 ratio of ALA to LA). Minimum requirements for essential fatty acids are 3 - 6% of daily calories for LA and 0.5 - 1% of daily calories for ALA.

What are they supposed to do?

Fish oils are well-publicized omega-3 fatty acids that have been shown to have many benefits. From a general health standpoint, EFAs are involved in literally thousands of bodily processes essential to our health and general well-being: immunity, aging, hormone production and hormone signaling... well, you get the point.

As one would expect, EFAs have been found to have many health uses including cholesterol reduction, cancer treatment and prevention and treating inflammatory conditions.

In particular, the omega-3 fatty acids are anti-lipogenic (they block fat storage), anti-catabolic, anti-inflammatory, and they increase beta-oxidation (fat burning!), improve insulin sensitivity, increase thermogenesis, and have a whole lot more positive effects on fat loss that we don't have the space, time, or need, to cover in this little review.

Recent research has found that EFAs, in particular the omega-3 lipids, control gene transcription. For the more technically adept: omega-3 lipids play essential roles in the maintenance of energy balance and function as fuel partitioners in that they direct glucose toward glycogen storage, and direct fatty acids away from triglyceride synthesis and assimilation and toward fatty acid oxidation.

Omega-3 lipids appear to have a unique ability to enhance thermogenesis and thereby reduce the efficiency of body fat deposition. EFAs exert their

effects on lipid metabolism and thermogenesis by up-regulating the transcription of the mitochondrial uncoupling protein-3 (UCP3), and inducing genes encoding proteins involved in fatty acid oxidation (e.g. carnitine palmitoyltransferase and acyl-CoA oxidase) while simultaneously down-regulating the transcription of genes encoding proteins involved in lipid synthesis (e.g. fatty acid synthase).

A lack of EFAs - in particular the omega-3 EFAs - appears to be one of the dietary factors leading to the development of obesity and insulin resistance seen in Syndrome X (see section on Chromium for more information on Syndrome X).

Of particular interest, the body makes something called prostaglandins (as well as other highly unsaturated compounds) from both of the essential fatty acids. Prostaglandins are highly active, short-lived, hormone-like substances that regulate cellular activity on a moment-to-moment basis. Prostaglandins are directly involved with regulating blood pressure, inflammatory responses, insulin sensitivity, immune responses, anabolic/catabolic processes, and hundreds of other functions known and yet unknown.

The long and the short of all this, without going into a long and boring biochemical explanation: omega-3 fatty acids are responsible for forming the anti-inflammatory prostaglandins, and omega-6 derived prostaglandins are responsible for making many of the pro-inflammatory prostaglandins (in addition to other products derived from EFAs - of which there are many).

Obviously, it's a lot more complicated than that, but hey, I only have so much space to write…

What does the research have to say?

For the purposes of this book, where essential fatty acids are most useful is for optimizing body composition. Research has shown omega-3 fatty acids added to the diets of animals such as rats, mice, and pigs, results in fat loss. Many in-vitro (test tube) studies also have been very clear as to the effects of flax oil (and other oils high in omega-3 fatty acids) on fat loss and other health related issues. There have been human studies that suggest flax oil can help with weight loss but there are no "smoking gun" type studies to convince the hardcore skeptic.

I wish I could show people the huge pile of research I have gathered over the years that demonstrate just how interesting and effective oils high in omega-3 fatty acids – can be for weight loss, health, and overall well being. Not all the research agrees (and it never does) but the vast majority of studies strongly suggest the omega-3 fatty acids from flax seed oil, fish oil, etc., are very effective for weight loss.

We need more human research to confirm this weight loss effect to the satisfaction of most scientists.

Most of the research over the years has in fact been done on the fish oils, and many people are already aware of such research. Flax oil and other high ALA oils have been more recently studied. The human body can, in fact, make the DHA and EPA preformed in fish oil from the ALA found in flax oil (via desaturase enzymes), but some controversy still exists as to how efficiently it's converted which is why some still recommend fish oils over flax.

Some studies suggest the conversion of ALA (found in flax) to EPA and DHA (the "fish oils") is more efficient then commonly believed. One study called "Dietary substitution with an alpha-linolenic acid rich vegetable oil increases eicosapentaenoic acid (EPA) concentrations in tissues" examined this issue.

This study took thirty healthy volunteers and separated them into two groups. Group one ate a high ALA and low LA diet. The other group ate a high LA and low ALA diet, which is more typical of the average American's diet. The study ran for eight weeks, which is a relatively short time. At the end of four weeks the group receiving a high ALA and low LA diet had significantly higher levels of EPA in their plasma lipid fractions than the group receiving a high LA/low ALA diet.

For another four weeks both groups were given fish oil supplements. The group that got the flax oil and fish oil supplements had far higher levels of EPA than the group getting fish oil without the flax oil leading researchers to conclude:

"…the results indicate that alpha-linolenic acid rich vegetable oils can be used in a domestic setting (in conjunction with a background diet low in LA) to elevate EPA in tissues to concentrations comparable with those associated with fish oil supplementation."

"…the results indicate that alpha-linolenic acid rich vegetable oils can be used in a domestic setting (in conjunction with a background diet low in LA) to elevate EPA in tissues to concentrations comparable with those associated with fish oil supplementation."

This is only one of several studies that found ingesting flax oil does raise EPA in tissues reliably and predictably. This does not however mean pre-formed EPA and DHA don't have their uses, and one study that fed people 6 grams of fish oil per day found significant weight loss.

In my experience, flax oil is quite effective for fat loss and providing other health benefits. In my view, there may be reasons not to use the fish oils as the sole source of omega-3 fats. They are far more susceptible to oxidation and rancidity. The production of fish oils for use as a supplement is not as well controlled as for flax seed oil and fish oils can contain toxins such as PCBs and other compounds. Fish oils do have their therapeutic uses however.

What does the real world have to say?

In the vast majority of people who have added flax oil to their diet (or other oils high in omega-3 fatty acids), improved fat loss has been the result. How much fat loss seems to be fairly individual and depends on many factors and physiological variables such as diet, exercise, initial fatty acid status, and body fat levels. Fish oil supplements also get high marks for fat loss with most people.

Recommendations

Flax oil has been a particular interest of mine for years. As some people may already know, I was the first person to popularize the use of flax oil with bodybuilders and other athletes for fat loss.

As I hope you can appreciate, I have attempted to distill a great deal of complicated information regarding the essential fatty acids and their effects on fat loss in this section, and I have of course left out a considerable amount of information in order to get to the point and offer a simple recommendation. However, you should certainly get the gist of it.

I generally tell people to take 1 - 3 tablespoons of flax oil per day mixed in a protein drink, put over a salad with some vinegar, or taken straight from the bottle. Don't bother with the capsules as it takes 12 - 14 capsules to equal one tablespoon, which becomes expensive and inconvenient.

However, most people don't like vague advice and request a specific figure. So, I recommend one tablespoon of flax oil for every 75 lb. of body weight,

though more can be used if desired. In fact, many "large and in charge" high level bodybuilders take up to seven tablespoons of flax oil a day before a contest and were still losing body fat on that much oil! People do not get fat on flax oil, period.

Ill-informed nutritionists who tell you "all fats will make you fat and should be avoided" are simply incorrect and have not done their homework.

There are however a few points to consider regarding flax oil. First of all, flax oil - like all polyunsaturated oils - is very sensitive to heat, light, and oxygen. It should never be heated or cooked with and should be kept in the fridge after opening the bottle.

Secondly, when a person increases their intake of such oils, they should also increase their intake of antioxidants such as vitamin C, E, selenium, and others. A good antioxidant complex is recommended.

Finally, there is a drawback to taking large amounts of flax for long periods of time, and that is the possibility that one could end up with a deficiency in the omega-6 EFAs.

What to do?

Several companies have developed oil products to address the issue of potential imbalances from long-term flax oil intake. For example, Dr. Erasmus (the fat guru) has a product aptly named *Udo's Choice Oil Blend*. (Note: long before the bodybuilding community became aware of the importance of EFA's for fat loss – thanks in large part to yours truly – Dr. Erasmus was extolling the virtues of the essential fatty acids for health, fat loss, and performance.)

As previously mentioned flax oil is particularly rich in omega-3 essential fatty acids (ALA) but is actually a poor source of the omega-6 fatty acid, LA. This makes flax oil "omega-3 rich" and "omega-6 poor" for long term use.

Many writers on nutrition have made the mistake of telling people that flax oil is a good source of the essential fatty acids, which is not true. It is a good source of the omega-3 essential fatty acids but lacks adequate omega-6 EFAs for long term use.

There are two schools of thought on how to look at this problem. One says

that most people already eat far too much omega-6 oils (which they do) and far too little omega-3 oils (also correct), and taking flax oil will bring you into balance. The other believes flax oil is too rich in omega-3 essential fatty acids and taking it exclusively will lead to an omega-6 deficiency.

Where do I stand on this issue? I think both assumptions are correct depending on the population (or individual) you are looking at. What various companies have done is alter the ratio of omega-3 to omega-6 by mixing different oils together to get something closer to a 2:1 ratio of omega-3 to omega-6, as opposed to the 4:1 ratio of flax oil. What this does is bring the ratio closer to what is optimal (and avoids any imbalances) while keeping it an omega-3 rich product that we find gets the best results. In addition, several companies have added other important and useful ingredients for health and fatty acid metabolism such as: lecithin, vitamin E, GLA, etc.

As you can see from the above discussion, not only do we need to get adequate amounts of both the essential fatty acids (ALA and LA), but we need to take them in the proper ratios with respect to one another. I have recently seen some of the companies that make these types of products, producing oils in a 1:1 ratio of ALA to LA, but I definitely prefer a product with more emphasis on the omega-3 essential fatty acids. I have seen much better results in health, fat loss, and muscle gains, from an omega-3 rich product.

Perhaps the best way of getting maximum benefits from such products is to use them most of the time, throwing in a bottle of flax once in a while. The person can then switch over to flax oil exclusively during specific times when losing fat is the immediate goal.

I have found using this strategy with bodybuilders before contests is an optimal solution, and I consider this strategy the best of all possible worlds. I have gotten some pretty impressive results with it. A person can, of course, make their own oil blend with various ALA and LA ratios by mixing LA rich oils with the flax oil, but products such as Udo's Choice just makes life easier, and many such products contain other useful ingredients.

As far as bang for your buck, flax oil and other oil blends are about the best weight loss health/improving product around in my humble opinion. As for fish oils, my advice is to eat at least two - three servings per week of fish known to be high in healthy fish oils, such as salmon and others.

To discuss Essential Fatty Acids further, you can post in the Members' Area.

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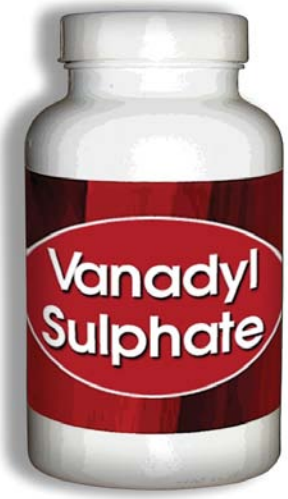
Vanadyl Sulphate

Return to T.O.C.



What is it?

Vanadium is a trace mineral found in small quantities in various foods with seafood, mushrooms, various cereals and soybeans, being the richest sources of this mineral. Vanadyl sulphate (often spelled sulfate) is the sulfur-bound form of the mineral. Vanadium can also be bound to other compounds, but the sulphate (a vanadium salt) is the one most often seen in supplement form.

What is it supposed to do?

Vanadium is similar to chromium (see chromium section) in its effects and mechanisms of action, Vanadium plays a direct role in the metabolism of carbohydrates and the regulation of blood sugar, as well as having effects on cholesterol and blood lipid metabolism. Vanadium is often referred to as an 'insulin mimicker' as it appears to be able to mimic the actions of insulin on various tissues. In athletes, the interest in vanadyl sulphate is related to its insulin mimicking mechanisms, such as possible effects on glycogen synthesis and muscle anabolism. In diabetics, vanadium supplements may have a positive effect in regulating blood glucose levels, as well as having effects on glycosylated hemoglobin levels in people with non-insulin dependent diabetes mellitus (NIDDM). In bodybuilders, it's claimed vanadyl sulphate makes muscles fuller due (one assumes) to the possible increased glycogen storage.

What does the research say?

The research with vanadium compounds has, as one might expect, focused mostly on its effects on diabetes. In both diabetics humans and animals, vanadium generally has positive effects on blood sugar regulation, hepatic insulin resistance, and other outcomes important to diabetics. Studies looking at the effects in healthy people are less dramatic. Few studies exist that look specifically at vanadium in healthy people and its effects on strength or body composition in particular. What does exist is not impressive. A study done in 1996 called "The effect of oral vanadyl sulfate on body composition and performance in weight-training athletes" found no significant effects on strength or body composition. This was a 12-week,

double-blind, placebo-controlled trial involving weight-training volunteers. The researchers looked at both 1 rep max and 10 rep max, as well as any body composition changes between the group getting the vanadyl sulphate and the placebo group. Thirty one subjects completed the 12 week trial, so it was a decent sized study that ran long enough to provide valuable information. It was concluded that:

"...oral vanadyl sulfate was ineffective in changing body composition in weight-training athletes, and any modest performance-enhancing effect requires further investigation"

"...oral vanadyl sulfate was ineffective in changing body composition in weight-training athletes, and any modest performance-enhancing effect requires further investigation."

What does the real world say?

Vanadyl sulphate had a short run as a popular supplement over a decade ago. It went the way of the Dodo bird in popularity due to the fact it didn't seem to work as claimed. Some people have reported they thought their muscles felt fuller, but that's about the most positive feedback I have gotten over the years.

Recommendations:

When vanadyl sulphate first came out, there were some serious safety concerns. However, studies don't seem to find acute toxicity with this supplement at doses normally used by people to improve glucose metabolism. At doses of 100 mg per day, gastrointestinal side effects are common. It should be noted however that all of the trace minerals, such as iron, chromium, and zinc, become toxic at high enough doses. The typical dose found in sports nutrition products provide 20 - 50 mg per day of vanadyl sulphate.

For people with diabetes, vanadyl sulphate may be of some use in blood sugar regulation and potentially reducing the need for insulin. If you have diabetes, make sure to consult your doctor before using this supplement.

In healthy athletes looking to add strength or LBM, vanadyl sulphate gets a big thumbs down from me. Money is far better spent on other supps covered in this e-book.

To discuss Vanadyl Sulphate further, you can post in the Members' Area.

Click Here

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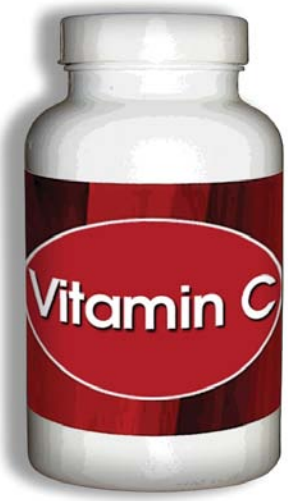
Vitamin C

Return to T.O.C.



What is it?

Vitamin C is an essential nutrient for only a few animals, including humans. Vitamin C can be synthesized from glucose in most plants and animals, but humans (and other vitamin C-requiring animals) lack L-gulono-gamma-lactone oxidase, the enzyme catalyzing the final step in the biosynthetic pathway.

What is it supposed to do?

Most people know vitamin C (ascorbic acid) as a simple vitamin and antioxidant needed for optimal health. They would be right. Vitamin C is a water-soluble antioxidant in the human body and plays a wide variety of roles in metabolism, ranging from immunity to hormone production.

What does the research say?

Vitamin C may also play additional roles above and beyond its simple role as an essential nutrient found in our diet and supplements.

Although exercise has been shown to improve antioxidant mechanisms, one well known side effect is that it raises oxidative stress and increases free radical production. Defenses can be overwhelmed over time and the risks of increased free radical production are well known, such as damage to DNA and a host of pathologies best avoided. When we factor in our various life styles and the environment, the issue of free radical production and oxidative stress is made more important.

Some studies have reported that supplementation with vitamins C and E, or antioxidant mixtures, can reduce oxidative stress from intense exercise and trained athletes who received antioxidant supplements show evidence of reduced oxidative stress.

Like all things in life, there is always a flip side and exercise is no exception. Though the benefits clearly outweigh the risks, we must acknowledge the potential downsides, or problems associated with exercise, and look for ways to minimize them. Although moderate exercise has been shown to

improve immunity, extreme and prolonged exercise has been shown to suppress the immune system.

This is commonly called, "over training syndrome" or OTS, and is common with athletes who train too long, too hard and too often. OTS is also found in elite military groups such as the US Navy Seals who are forced to train under extreme conditions.

One study found that a group of runners who trained for a marathon, but did not compete, was much less likely to get upper respiratory infections than the runners who completed the race, showing how much such endeavors can take out of a person.

Vitamin C has been shown to reduce oxidative stress and suppress levels of the muscle wasting hormone cortisol, as well as prevent the decline in immunity after intense exercise.

However, not all studies agree on these effects of vitamin C, or antioxidants in general, on immunity. Athletes should not view taking additional vitamin C as a direct performance enhancer per se, but as a long term preventative nutrient essential to long term health. Without good health, clearly, performance will suffer.

So, indirectly, adequate vitamin C intakes are important for long term performance, although studies don't find positive effects on short term performance.

What does the real world have to say?

Anecdotally, there are some who feel taking higher doses of vitamin C have been helpful for boosting immunity to colds and other upper respiratory infections.

Recommendations:

Exactly what the "optimal" intake of vitamin C remains to be elucidated, but there appears to be no health risks associate with taking higher amounts than the RDA recommend. Individual intakes of vitamin C can range dramatically, from 100 mg per day to several thousand milligrams, with most studies looking at "high dose C" using between 200 and 1000 mg per day.

Although there is not an optimal dose known at this time, 200-500 mg daily of vitamin C added to an athletes diet is a common dose and should be adequate.

For general health and well being, vitamin C gets a big thumbs up, but for direct effects on building muscle or improving performance, it has to get a thumbs down.

To discuss Vitamin C further, you can post in the Members' Area.

Click Here

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Vitamin E

Return to T.O.C.

What is it?

"Vitamin E" actually refers to a family of structurally related compounds: alpha, beta, delta and gamma tocopherols, and alpha, beta, delta, and gamma tocotrienols. All are biologically active, although alpha-tocopherol is the form maintained in plasma, and is the one most likely to be found in multivitamins and other supplements and fortified foods. Most of the research studies to date on the benefits of vitamin E have focused on the alpha-tocopherol form, which is the only one for which an RDA has been established.

What is it supposed to do?

Vitamin E supplements are taken to mitigate oxidative stress.

What does the research say?

Most of what was said about Vitamin C above will be similar for Vitamin E. As with C, people are familiar with vitamin E as a simple vitamin and antioxidant needed for optimal health.

Vitamin E is the major fat soluble antioxidant in the human body and plays a wide variety of roles in metabolism, ranging from immunity to fertility to hormone production. As with all antioxidants, Vitamin E works in conjunction with other antioxidants such as Vitamin C, glutathione, selenium, and beta-carotenes, as well as with key antioxidant enzymes, such as superoxide dismutase, glutathione peroxidase, and catalase.

As mentioned in the Vitamin C section: although exercise has been shown to improve antioxidant mechanisms, one well known side effect is that it raises oxidative stress and increases free radical production.

Defenses can be overwhelmed over time and the risks of increased free radical production is well known, such as damage to DNA, reduced immunity, susceptibility to upper respiratory infections and other potential health problems best avoided. When we factor in our various life styles and environment (e.g., pollution, ozone, etc) the issue of free radical produc-

tion and oxidative stress is made more important.

Some studies have reported that supplementation with vitamin E and/ or antioxidant mixtures, can reduce oxidative stress from intense exercise and trained athletes who received antioxidant supplements show evidence of reduced oxidative stress. Studies with Vitamin E that have looked directly at performance have been contradictory, with most studies finding no direct effects on performance.

Vitamin E has been shown to reduce oxidative stress. In particular, because Vitamin E is fat soluble, it helps to prevent something called exercise-induced lipid peroxidation.

For example, one recent study evaluated the effects of 5 months of Vitamin E (alpha-tocopherol) supplementation on physical performance during aerobic exercise training in 30 top-class cyclists. The study found the plasma Vitamin E concentration increased significantly in the vitamin E-supplemented group, whereas the placebo group showed a trend toward decrease.

The study also found statistically significant drops in biochemical indices of oxidative stress in the group getting the vitamin E. However, they did not find direct improvements in performance in the vitamin E group over that of placebo.

Some studies suggest Vitamin E can prevent the decline in immunity after intense exercise. However, it should be noted that not all studies agree on these effects of vitamin E or antioxidants, in general, on immunity.

It is interesting to note that other members of the vitamin E family may also exert protective effects that are distinct from alpha-tocopherol. For example, gamma-tocopherol - unlike the alpha form - is able to scavenge nitrogen radicals - which also can damage cells and tissues. More research is required, however, to assess whether supplementing with other members of the vitamin E family confer more benefits than supplementing with alpha-tocopherol alone.

What does the real world have to say?

Very little: no one I've spoken to has ever reported any direct gains or improved performance as a result of taking vitamin E.

Recommendations:

Athletes should not view taking additional vitamin E as a direct performance enhancer per se, but as a long-term preventative nutrient, essential to long-term health.

Good health is, after all, a prerequisite for performance over the long run. Clearly, adequate vitamin E intakes are important for long-term performance, although studies don't find positive effects on short-term performance.

What exactly is the optimal intake of vitamin E is unclear at this time, but there appears to be no health risks associate with taking higher amounts than the RDA. Individual intakes of vitamin E vary dramatically, with most studies using between 200 IU to 800 IU per day. Although there is not an optimal dose known at this time, 400 IU to 800 IU appears safe and effective. The US Institute of Medicine has established a tolerable upper intake level (UL) for alpha-tocopherol of 1,500 IU/day for adults.

Even less is known about optimal intakes of gamma and other tocopherols, although some researchers have suggested that both the gamma and alpha forms should be used when conducting trials on the efficacy of vitamin E supplementation for cancer prevention.

For general health and well being, Vitamin E gets a thumbs up, but for any anabolic or performance enhancing effects, it gets a thumbs down.

To discuss Vitamin E further, you can post in the Members' Area.

Click Here

"Good health is, after all, a prerequisite for performance over the long run. Clearly, adequate vitamin E intakes are important for long-term performance, although studies don't find positive effects on short-term performance."

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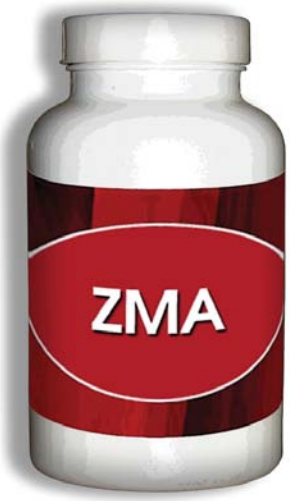
ZMA

Return to T.O.C.



What is it?

ZMA is a supplement consisting of two amino acid-chelated minerals, zinc and magnesium, plus vitamin B_6.

What is it supposed to do?

ZMA is claimed to raise the anabolic hormones testosterone and IGF-1, and possibly to improve performance in athletes.

What does the research say?

The claims are lofty, but are they true? The claims of such products rest on three basic premises:

1. Athletes are notoriously lacking in zinc and magnesium due to several factors ranging from poor diets to increased usage and excretion of these minerals.

2. Zinc and magnesium are particularly important minerals in the production of anabolic (muscle building) hormones needed by athletes.

3. Due to competition during digestion, even the inclusion of a multivitamin and other mixed mineral supplements will not correct the deficiency.

That's the basic contention of this zinc and magnesium based product in a nut shell, with some biochemical twists and turns I am leaving out due to space limitations and to preserve the brain cells of the readers!

A fourth contention is that these new products are based on a particular form of zinc and magnesium (zinc monomethionine-aspartate and magnesium aspartate) which are superior to less absorbable forms of the minerals. This brings us to ZMA.

Looking at premise number one, there is a decent body of research that has indeed shown that zinc and magnesium deficiencies are not uncom-

mon in various athletes, such as football players, cyclists, bodybuilders, and elite military groups.

Looking at premise number two, it is well established that these two minerals are needed in over 300 different enzymatic reactions and the production of testosterone is one of them. Examining premise number three, there are several studies that examined the issue of nutrient interactions and, indeed, found that certain minerals compete for absorption and so, may not get absorbed if taken together.

Several studies have found that even the addition of a multivitamin to the diet of people did not increase the levels of zinc, magnesium and other minerals, while the serum vitamin levels did go up. The authors theorized this was due to competition of the minerals in the multivitamin.

So, it would appear that different minerals need to be taken at different times and taking them altogether may not be an optimal, or even effective, strategy for increasing levels of these minerals in tissues.

"So it would appear that different minerals need to be taken at different times and taking them together may not be an optimal, or even effective, strategy for increasing levels of these minerals in tissues."

The fourth contention regarding the forms of minerals is a bit more unproven, in this writer's view. Though it is well known that there is a wide range of absorption between different forms of nutrients, especially minerals, so the concept is not far fetched.

The idea behind these supplements is to supply highly absorbable forms of non-competing minerals (in this case zinc and mag) known to be essential for the optimal production of anabolic hormones. Though a variety of companies are now selling this product, the letters ZMA appear in the name or on the bottle only if the product is using the patented ingredients.

We note the research done by a Dr. Brilla at Western Washington University. Dr. Brilla found the addition of 30 mg of zinc monomethionine-aspartate and 450 mg of magnesium aspartate (the forms used in ZMA) daily to football players had a 32 percent increase in total testosterone, a 3.6 percent increase in IGF-1, and improvements in strength levels.

So, at this time, the general contention of the companies now selling this new zinc and magnesium based products appears to hold water, though future research needs to elucidate these findings further.

What does the real world have to say?

Some have reported seeing modest gains in strength and performance with ZMA, although perhaps for an additional reason: ZMA is taken at bedtime, on an empty stomach. Taken this way, many insist that it helps them get a good night's sleep, and that reason alone is enough for many people to continue taking it.

Recommendations:

With regard to the relationship between essential minerals and testosterone, one important caveat to remember with ZMA (or similar product) is that it will only work if there is a deficiency to correct. Supplementation will not increase levels of anabolic hormones where no deficiency in these minerals exists. ZMA is not magic, by any stretch.

As an aid to sleep, however, ZMA appears to be effective and useful. So, I give this supplement a thumbs up, understanding the caveat above.

To discuss ZMA further, you can post in the Members' Area.

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Anti-Estrogens

Return to T.O.C.

The potentially negative effect of the "female" hormone estrogen is a constant concern for athletes. Increased estrogen may lead to increases in body fat and other maladies athletes want to avoid (gyno, etc.) and many supplement companies have attempted to capitalize on this concern over excessive estrogen levels.

For example, some research suggests that supplements such as androstenedione, and a few of the other "andros," may increase estrogen levels by converting to estradiol (a powerful estrogen). Androgens such as testosterone and androstenedione convert to estradiol via an enzyme called "aromatase." Drugs or natural compounds that can block this enzyme are therefore called "anti-aromatase" agents.

Basically, there are two ways to affect estrogen. You can block the receptor site, or you can inhibit the enzyme (i.e. aromatase) that converts "male" hormones into "female" hormones (i.e. estrogens).

When a molecule fits into the receptor but does not send an estrogenic signal, it is called an "antagonist" meaning it prevents or "blocks" estrogen from getting to the receptor, but does not, in itself, act as an estrogen. Hence the term "estrogen blocker."

When something can lock into the receptor and does act as an estrogen, that is, activates the receptor to one degree or another, it's called an "agonist." So, an antagonist fits into a receptor (thus blocking something else from occupying that receptor) but does not activate the receptor and an agonist fits into the receptor in question (in this case an estrogen receptor) and does activate the receptor to one degree or another.

This is exactly how the drug Tamoxifen works, when treating breast cancer. It can fit into the estrogen receptor, but does not activate it thus preventing estrogenic effects in the tissue in question.

Thus, Tamoxifen is an "estrogen antagonist." In truth, it's a bit more complicated than that as Tamoxifen is, in fact, both an estrogen antagonist or agonist depending in the tissue in question, which means it has mixed antagonist/agonist effects, but never mind…

So, what the reader should take away from the above is, you can block the effects of estrogen by either blocking the receptor it fits into, or inhibit the enzyme the body uses to convert androgens into estrogens. Got all that?

The use of anti-estrogen drugs and supplements is a part of post-cycle therapy (PCT). PCT is a standard part of any anabolic steroid or prohormone cycle. PCT facilitates the transition to natural testosterone production following suppression by exogenous hormones.

Many people, however, are more interested in simply boosting their own natural T production, and anti-estrogen supplements offer a means to do this. Some drug studies have demonstrated that - in principle - the concept is reasonably sound, although there is no information on the possible long term effects of doing this.

Chrysin

Return to T.O.C.

What is it?

Chrysin is 5,7-dihydroxyflavone, a flavonoid found in large concentrations in Passiflora (Passionflower). Flavonoids are naturally-occurring compounds found in plants that possess a variety of biological activities, including antioxidant activity.

What is it supposed to do?

Chrysin has been marketed as an anti-aromatase, or enzyme inhibitor. Chrysin is sold alone, or often added to other supplements, in hopes it will prevent any estrogen production that may result from taking prohormone or other hormone-based supplements. Chrysin is a bioflavonoid similar to other flavonoids such as quercetin.

What does the research say?

There are many different types of flavonoids with a wide range of effects. In vitro (test tube) research has shown chrysin is a powerful inhibitor of the aromatase enzyme and may have other health uses.

One thing to remember, however, is that in-vitro research may be misleading when it comes to judging what a compound will do when it's taken orally. That's because the compound in question has to go through the processes of digestion and absorption. It may be changed in the process so that it's inactive, or perhaps even toxic. Or it may never be absorbed at all, but excreted unchanged.

This last is the most likely outcome. Other bioflavonoids such as quercetin, are notoriously difficult to absorb during digestion and very little gets through. The same may be true for chrysin.

One small study using chrysin-containing foods (honey, propolis) showed no effects on serum testosterone after 21 days of feeding. This study was far from conclusive, however, since this method of administration was not directly comparable to supplementation. However, another study using human volunteers as well as rats demonstrated that the oral bioavailability

of chrysin is low. The researchers stated:

"the oral bioavailability of chrysin was estimated to be 0.003–0.02%...Thus the ability of chrysin to influence androgen and oestrogen concentrations in peripheral human target tissues by inhibiting this enzyme is questionable."

"...the oral bioavailability of chrysin was estimated to be 0.003-0.02%... Thus the ability of chrysin to influence androgen and oestrogen concentrations in peripheral human target tissues by inhibiting this enzyme is questionable."

Another study, in which rats were dosed with 50 mg/kg chrysin saw no changes in estrogen or androgen-induced uterine growth and came to a similar conclusion.

To date, no solid studies using chrysin in walking, talking, human beings have shown that Chrysin, indeed, can reduce estrogen levels and/or increase testosterone.

What does the real world have to say?

In truth, I have yet to see anyone who derived any benefit from this supplement.

Recommendations:

For reducing estrogen in athletes, chrysin gets a big thumbs down.

To discuss Chrysin further, you can post in the Members' Area.

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I3C/DIM

Return to T.O.C.

What are they?

Indole-3-carbinol (I3C) is a breakdown product of indole-3-glucosinolate - a compound that is produced in cruciferous vegetables such as cabbage and broccoli. When ingested, I3C is further broken down by stomach acid into diindolylmethane (DIM).

What are they supposed to do?

I3C and DIM are found in certain bodybuilding supplements due to their role as estrogen metabolism modulators. Their role is to induce the formation of "good" estrogen metabolites, which are supposed to compete with testosterone for protein binding, thus enhancing free T while theoretically reducing the negative effects of the "bad" estrogens.

What does the research say?

As alluded to above, not all estrogens are created equal. There are different forms of estrogen in the human body. Estradiol is the primary form, and can be metabolized in different ways. Certain metabolites, 16-alpha-hydroxyestrone and 4-hydroxyestrone, are thought to be responsible for the carcinogenic effects of estrogen, most notably in breast cancer, but have also been implicated in prostate cancer risk. An alternate metabolic pathway involving the formation of 2-hydroxyestrone, however, carries no such risk. In fact, 2-hydroxyestrone is viewed as being protective against certain cancers, and is known as the "good" estrogen.

A number of in-vitro (test tube), rodent, and - now - human studies have demonstrated that indole-3-carbinol, and its metabolites, DIM/ICZ (indolylcarbazole), can influence estrogen metabolism by increasing the formation of 2-hydroxyestrone, and favorably improving the ratio of 2-hydroxyestrone to 16-alpha-hydroxyestrone, a biomarker for cancer risk.

One early study, for example, found that giving 500 mg/day for 1 week to human volunteers, increased estradiol 2-hydroxylation from an average of 29.3% to 45.6%. A later study by the same group demonstrated that intake of I3C (6 - 7 mg/kg/day) not only increased the urinary excretion

of 2-hydroxylated metabolites, but also decreased the amounts of other estrogen metabolites, including estradiol, estrone, estriol, and 16-alpha-hydroxyestrone. At this point, the evidence in favor of I3C as a possible preventive measure is sufficiently strong, that clinical trials are being conducted to determine its use for reducing the incidence of breast cancer in women at high risk for developing the disease.

DIM may also exert anti-cancer activity directly, by inhibiting the formation of blood vessels that support tumor growth.

So what does this have to do with testosterone? There are a couple of intriguing hypotheses, based on limited evidence. One is an experiment with rats, which showed that injections of estradiol and 4-hydroxyestradiol suppressed LH (luteinizing hormone), while 2-hydroxyestradiol had no effect. A second experiment also showed that administration of 2-hydroxyestradiol immediately before estradiol injection reduced the estradiol-mediated suppression of LH. So it's possible to speculate that I3C/DIM could alter estrogen metabolism in ways that reduce feedback inhibition of testosterone production.

"So it's possible to speculate that I3C/DIM could alter estrogen metabolism in ways that reduce feedback inhibition of testosterone production."

Another hypothesis involves a downstream 2-hydroxylated estrogen metabolite: 2-methoxyestradiol, which has been shown to have an even higher affinity for sex hormone binding globulin (SHBG) than either estradiol or testosterone. It's been speculated that increased levels of 2-methoxyestradiol could compete for SHBG binding and thus increase levels of free T.

Needless to state, there isn't a shred of actual evidence that either of these hypotheses have any merit, or that - even if true - there are any real world benefits for athletes looking to add mass and strength.

What does the real world have to say?

Indole-3-carbinol in particular is found in several different supplement blends designed to increase T. I've yet to meet anyone who has made any significant gains in mass or strength by using these supplements. The problems are: 1) products sold containing these compounds are very under-dosed; and 2) are always mixed with a bunch of other compounds, so useful feedback does not exist. No one to date has taken it alone and in sufficient doses, and had blood work done to see if it was impacting estrogen metabolism and/or T levels.

Recommendations:

I3C/DIM may certainly have uses for cancer prevention and/or treatment, and may have legit health uses in general. In theory, it may be a supplement to use with men taking testosterone replacement or athletes using AAS, but that's all hypothetical at this point. As far as some healthy young guy taking these compounds in hopes of raising T and noticing some actual changes in body composition or strength, forget it. For direct bodybuilding uses (e.g., increased T, increased LBM, increased strength, etc.) I give them two thumbs down at this point.

To discuss I3C/DIM further, you can post in the Members' Area.

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6-OXO

Return to T.O.C.

What is it?

6-OXO (androst-4-ene-3,6,17-trione) is a naturally occurring compound with anti-aromatase/anti-estrogen properties. It's produced in the human body or can be produced synthetically.

What is it supposed to do?

6-OXO is believed to decrease estrogen and increase testosterone via its effects on the enzyme (aromatase) which converts testosterone to estrogen. 6-OXO appears to be what's known as an irreversible suicide inhibitor of the enzyme. As the name implies, once bound to the aromatase enzyme, the process cannot be reversed, hence the term "irreversible suicide inhibitor." Translated, 6-OXO binds to the enzyme and prevents it from doing its normal function, which is to produce estrogen from androgens (testosterone, etc.) . As most people know, excess estrogen (in particular estradiol) can lead to negative effects such as increased body fat, water retention, gynecomastia (bitch tits), reduced libido, as well as other clinical conditions best avoided. Increased estradiol is often found in steroid users, aging men, as well as other populations.

6-OXO appears to increase testosterone - and keep estrogen in check - by altering a key feedback loop in how the body regulates testosterone production. Exactly how the body regulates various hormones is a very complex topic beyond the scope of this section. Suffice it to say, it primarily involves what's called the hypothalamic-pituitary-testicular axis (HPTA) which works via overlapping negative feedback loops. Estradiol is key in this system. Estradiol is suppressive to testosterone production. High estradiol sends the signal there is high testosterone, and T production is reduced. Lower estrogen, and the body thinks T is low, and sends the signal to produce more T. Reducing estrogen levels is a way to fool the HPTA into producing more T, via an increase in the gonadotropins: follicle stimulating hormone (FSH) and luteinizing hormone (LH) That's the basic mechanism, which has been greatly over simplified.

The bottom line is: 6-OXO may allow for a more favorable testosterone/estrogen ratio by altering the "set point" for these two hormones. 6-OXO

is not an anabolic/androgenic steroid, is not a pro-hormone, and does not work via androgen receptors or as an anabolic compound directly.

What does the research say?

6-OXO (chemical name androst-4-ene-3,6,17-trione) is also known as 3,6,17-androstenetrione or 6-ketoandrostenedione. In-vitro (test tube) and animal studies exist that find 6-OXO acts as a suicide inhibitor of aromatase. That's the good news. The bad news is, studies in living people are limited. The human studies that exist look quite promising but suffer from a variety of drawbacks, such as the fact they don't appear to have been published in any peer-reviewed journals. More on that later. One study called "The Chronic Effects Of Androst-4-ene-3,6,17-trione On Endocrine Responses In Resistance-trained Men" examined six healthy male subjects, ages 32- 40 years of age who were given 300 mg of 6-OXO twice per day for 3 weeks. The study design was open label with 6 participants and ran three weeks. All subjects followed a specified resistance training program (consisting of 4 days per week) and diet was not controlled for.

"The results of this study reinforce the concept of an altered set point for the two hormones vs. a drastic reduction of estrogen."

The study found total testosterone levels rose an average of 188%, while free testosterone levels rose an average of 226% over the course of the three weeks. The study found there was a slight decrease in estrogen, but the effect was small. They also found no acute toxicity to lipid levels or liver function. The results of this study support the concept of an altered set point for the two hormones vs. a drastic reduction of estrogen.

What does the real world have to say?

As far as noticing any direct effects on muscle mass or strength, feedback for 6-OXO has been negative with most reporting no changes. However, people that have actually gotten blood work done while using 6-OXO have reported small but consistent increases in testosterone, free testosterone, without an increase in estradiol or a slight decrease.

Recommendations:

As anyone can see, the one human study was small (n = 6), short lived, and apparently not published in any journal I am aware of. Taken together with other research (in vitro and animal), 6-OXO is still a compelling supplement in my view. It may be of use for combating issues surrounding elevated estrogen levels due to steroid use, pro hormone use, age, etc. Recommend-

ed dose appears to be 300-600 mg per day. However, it's also clear from user feedback that people should not expect any major changes in LBM, body fat, or strength. Readers should note even the small human study mentioned above failed to look at any of those essential outcomes. Clearly, a larger better controlled, longer, study needs to be conducted to get a thumbs up from me.

In theory, an increase in total testosterone, free testosterone, without increases in estradiol, should = an increase in muscle mass and other positive effects over time, but it's speculation at this time as it applies to 6-OXO. The almost universal negative feedback is puzzling. My hunch is that there needs to be a high enough increase in testosterone to hit some physiological threshold for people to see real changes in body composition. For example, if one injects 100 mg of testosterone per week (a fairly typical dose for replacement in men with low T), blood work will show a clear increase in this hormone. However, the person will not generally see any changes in body composition. Not until the person uses at least 200 mg per week (if not more) do we see real changes in body composition, thus there appears to be a threshold that needs to be reached for changes in body composition to occur. Keeping all that in mind, this supplement will go into the "might be worth a try" category.

To discuss 6-OXO further, you can post in the Members' Area.

Click Here

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Herbal Testosterone Boosters

Return to T.O.C.

Short of seeing an endocrinologist and getting a prescription, there aren't many (legal) ways you can raise testosterone directly. Yet increasing T has obvious benefits, both for body composition and enhancing libido.

Enter herbal testosterone boosting supplements...

Many plants contain steroidal compounds that are similar in structure to human steroid hormones. Extracts of these plants are consumed in the hope that these compounds will ultimately be converted to testosterone in the body, or else stimulate testosterone production. Not surprisingly, many of the extracts on the market have been used as aphrodisiacs in folk medicine.

Herbal supplements are appealing due to the fact that they're "natural" - so presumably safer and more healthy than taking prescription drugs. But, as I wrote earlier in my mini-article in the BBR Members' Area, the term is completely ambiguous. There are lots of things that are completely natural, yet harmful to your health. "Natural" is not synonymous with "safe" or "wholesome."

Long-term health and safety issues aside, the larger question is: do they really work as claimed? Some answers lie in the pages that follow.

Avena sativa

Return to T.O.C.

What is it?

Avena sativa is the botanical name for wild oats. The seeds contain various bioactive compounds, such as the alkaloids gramine and avenine; the saponins avenacoside A and B; and avenanthramides, which are polyphenolic compounds with antioxidant activity.

What is it supposed to do?

Avena sativa (AS) has been traditionally used in folk and alternative medicine as a treatment for exhaustion and depression. It has also been utilized as a (questionable) treatment for morphine and tobacco addictions. The reason, however, for its appearance in a growing number of bodybuilding supplements is its reputation as an aphrodisiac and testosterone booster.

What does the research say?

There is certainly plenty of research on oats these days. Oat fiber (especially beta-glucan), for example, can reduce serum cholesterol, and oats are one of the few foods for which health claims are allowed to be made by the FDA. As alluded to above, oats also contain antioxidant compounds, known as avenanthramides, that have been shown to have anti-inflammatory and antiatherogenic activity in both animal and in-vitro (test tube) experiments. The avenacosides also appear to exert some physiological effects in animal experiments, by increasing intestinal permeability and (slightly) reducing liver lipids.

So where does AS's rep as an aphrodisiac and T-booster come from?

Good question. There isn't a single published study - not even of the aforementioned test tube variety - that suggests wild oats has any effect on either sex hormone levels or libido! There aren't even any reputable unpublished studies, such as conference presentations, posters, etc.

As near as I can figure out, AS's reputation comes from one source: an outfit known as "The Institute for Advanced Study of Human Sexuality", based in Northern California. The Institute alleges that their research on the sexually

stimulating properties of AS began in 1979, with several research "studies" taking place throughout the 1990s. Not surprisingly, the Institute markets a line of AS supplements under the "Vigorex" label. The Vigorex products are claimed to be homeopathic - which means that the extract has also been extensively diluted. As it says in the glossary, homeopathic preparations are "... an expensive technique for consuming small quantities of water."

The Institute alleges that AS works by increasing the amount of free testosterone. Looking at the text descriptions of the "studies" (which contain no actual data), this claim appears to be based solely on results obtained from 6 subjects, 4 of whom had "... no significant endocrine changes" whatsoever! Suffice it to say, this isn't very convincing.

Is there any possibility AS could enhance libido? There is some in-vitro (test tube) research that demonstrates avenanthramide-2c can increase nitric oxide (NO) production. In one human feeding study, oats were also shown to enhance endothelial function and vasodilation. The oat alkaloid gramine also has vasorelaxing effects. NO production and vasodilation are important for achieving an erection, so it's possible to speculate that oat compounds could enhance sexual function through this mechanism. But it's a stretch to say that AS supplements actually accomplish this - or accomplish this in the doses seen in bodybuilding supplements.

"Looking at the text descriptions of the 'studies'... this claim appears to be based solely on results obtained from 6 subjects, 4 of whom had 'no significant endocrine changes' whatsoever! Suffice it to say, this isn't very convincing."

What does the real world have to say?

There are very few supplements that are pure AS. I've seen a handful of reviews from users of AS powder, who feel it's been beneficial for mood and sleep. This reaction lends some support to the traditional, medicinal use of oat teas and tonics. I've also seen a couple of positive comments about libido, but this could easily be a placebo effect. Oats have been used medicinally and as food for centuries - you would think that any actual effects would have been noticed long before the "Institute for Advanced Study of Human Sexuality" happened on the scene.

Needless to state, not even the few reports I've seen have anything positive to say about increases in strength or lean body mass.

Recommendations:

You can guess what I have to say about Avena sativa: it gets a thumbs

down from me for increasing muscle or improving performance, let alone increasing T or libido.

To discuss Avena sativa further, you can post in the Members' Area.

Click Here

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Fenugreek (Testofen™)

Return to T.O.C.

What is it?

Fenugreek is Trigonella foenum-graecum L., a medicinal herb also used as a spice and flavoring agent. It's best-known uses are in curry powder and in processed food products where it's used as a maple flavoring.

What is it supposed to do?

Among other traditional medicinal uses, fenugreek is used to treat diabetes, and is sometimes included in OTC diet supplements due to its ability to enhance glycemic control and insulin sensitivity. Its primary use in most bodybuilding supplements, however is as a "natural" way to increase testosterone levels. Testofen™ is a proprietary fenugreek extract used in many current supplements.

What does the research say?

Fenugreek contains a wide range of interesting and potentially useful compounds, including the saponin steroid precursor diosgenin, as well as other saponins, such as yamogenin, gitogenin, smilagenin, and protodioscin. Fenugreek also contains polyphenolic antioxidants as well as an unusual and unique amino acid: 4-hydroxyisoleucine.

There is a fair amount of research on fenugreek as a potential therapeutic agent in diabetes. Both animal studies and a few human studies indicate that fenugreek can help improve glycemic control and reduce the risk of various diabetes-related pathologies. In a rat model of diabetes, for example, both water and ethanol extracts of fenugreek seeds significantly reduced blood sugar levels and improved glucose disposition. Oral administration of a water extract of fenugreek seeds to diabetic rabbits for 30 days also significantly lowered fasting blood glucose.

A limited number of human studies have been done, but the results look promising. Fenugreek seed powder (100 g/day) was incorporated into the diets of Type I (insulin-dependent) diabetics for 10 days in an Indian clinical study. The researchers concluded that:

"The fenugreek diet significantly reduced fasting blood sugar and improved the glucose tolerance test. There was a 54 per cent reduction in 24-h urinary glucose excretion. Serum total cholesterol, LDL and VLDL cholesterol and triglycerides were also significantly reduced."

A study on Type 2 diabetics receiving 1 g/day of fenugreek seed extract for 2 months had improved glycemic control, reduced insulin resistance and decreased serum triglycerides relative to controls.

Part of fenugreek's ability to improve glucose/insulin status in diabetics is due to 4-hydroxyisoleucine. This unusual amino acid may have some application to athletes: one recent study demonstrated that the addition of 2 mg/kg 4-hydroxyisoleucine to post-workout dextrose improved rates of glycogen resynthesis following a glycogen depletion ride by 63% vs. dextrose alone.

The saponins in fenugreek have been shown to reduce serum cholesterol in animal models. Other experiments have suggested that fenugreek has gastroprotective and hepatoprotective effects. Fenugreek extracts also appear to protect against lipid peroxidation.

What about evidence that fenugreek increases testosterone? The short version is: there isn't any. Not one single study exists that demonstrates that fenugreek has any impact on T levels.

Fenugreek does contain diosgenin, a plant steroid that serves as the raw material for the synthesis of steroids for medical and veterinary use. Mexican wild yam is a principal source of this compound, and wild yam extracts are also sold as supplements to both men and women in the mistaken belief that the diosgenin can be converted to active sex steroids in the body. This is not true, however; the conversion of diosgenin to progesterone, estrogen and/or testosterone can occur only in the laboratory. So people who hope that fenugreek will increase testosterone or have other steroid-like effects due to its diosgenin content are going to be disappointed.

Fenugreek also contains protodioscin, which is presumed to convert to. or stimulate production of, DHEA in the body. Protodioscin is also the active principle in Tribulus terrestris, which is reviewed later in this chapter. As discussed in the review, Tribulus supplementation has no significant effects on either testosterone levels, lean body mass or strength, so it's unlikely that fenugreek would significantly increase T levels due to its protodioscin

"The fenugreek diet significantly reduced fasting blood sugar and improved the glucose tolerance test. There was a 54 per cent reduction in 24-h urinary glucose excretion. Serum total cholesterol, LDL and VLDL cholesterol and triglycerides were also significantly reduced."

content either.

That hasn't stopped some supplement companies from trying, however. One company, Gencor Pacific, markets a fenugreek extract called "Testofen™" that appears in certain bodybuilding supplements. Testofen™ is standardized to "50% fenuside" and is claimed to increase testosterone, as well as libido. Gencor Pacific presents selected data from 2 "in house" rodent studies to back up their claims.

What is "fenuside"? According to the company: *"Fenuside is one such saponin glycoside identified by us."* Unfortunately, this means that its identity is proprietary information - there is no such compound in the scientific literature.

How does it work? According to the Gencor Pacific's own report:

1. *Testofen TM seems to have mode of action through the Adrenal Cortex. It seems to stimulate the secretion of Corticotropin Releasing Hormone [CRH] from the Hypothalamus in the brain.*

2. *The CRH reaches the Anterior Pituitary Gland and stimulates it to produce Adrenocorticotropic Hormone [ACTH]. ACTH then acts on the cells of the Adrenal Cortex stimulating them to produce Androgens. Androgens are precursors to Testosterone with Testosterone like activity, the common one being Androstenedione.*

It just so happens that the "Androgens" produced from the adrenal cortex are none other than DHEA and - to a lesser extent - androstenediol. It has been well-established that this pathway does not contribute significantly to testosterone in men, although it can in women.

This raises the suspicion that maybe "fenuside" is simply protodioscin by another name, although there's no real way to know, short of a laboratory analysis. And while the limited data Gencor-Pacific has available shows an increase in T levels with Testofen™ administration, testosterone increases in mice are also seen with DHEA administration. The company has not submitted its studies to any peer-reviewed journal, so until an independent test in humans is performed, I remain skeptical of the claims for this extract.

What does the real world have to say?

Fenugreek and/or Testofen™ are rarely taken "straight", so there's been no relevant feedback on whether or not either have any effect on lean mass or performance. It's safe to say, however, that feedback on the supplements that they're used in has been mixed, at best.

Recommendations:

Fenugreek may have benefits to health, and may even be useful to athletes by enhancing post-workout glycogen resynthesis. But for improving strength or building muscle, it gets a thumbs down from me.

To discuss Fenugreek further, you can post in the Members' Area.

Click Here

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Horny Goat Weed

Return to T.O.C.

What is it?

Horny Goat Weed is the English version of the Chinese name for herbs of the genus Epimedium: the Chinese *yinyanghuo* translates to "licentious goat-fire". Legend has it that the name was given by a goat herder who noticed that his goats became more...active after eating the plants. There are 25 known species, although E. grandiflorum, E. sagittatum, E. brevicornum, and E. koreanum appear to be the most widely used and best characterized.

What is it supposed to do?

In traditional Chinese medicine, horny goat weed is used to treat bone fractures and osteoporosis, improve kidney function, treat impotence/infertility and boost the life force or "qi". It's included in a number of bodybuilding supplements as an aphrodisiac and natural testosterone booster.

What does the research say?

Western scientists have shown little interest in horny goat weed research. This deficit has been more than made up for by Chinese researchers, who have conducted extensive research on the herb. The majority of these studies, however, are published in Chinese journals, rather than peer-reviewed international journals. So this review is necessarily based on the less extensive work that's been published in more mainstream sources.

As is the case with natural herbal products, horny goat weed has a spectrum of biological activities. One interesting property of the herb is its ability to inhibit bone resorption by osteoclasts in both animal and in-vitro (test tube) studies. Another study found that Epimedium extracts induce osteoblast proliferation. Osteoclasts and osteoblasts are the cells responsible for bone remodeling: osteoblasts build up bone while osteoclasts break it down. So the potential effect of Epimedium in these studies is to preserve and build bone, a function that has possible therapeutic applications for the treatment of osteoporosis.

The major active compound in horny goat weed is thought to be the fla-

vonoid icariin. In-vitro studies have shown icariin has potential hepatoprotective, antidepressant and antioxidant activities.

More germane to this review, there is some preliminary evidence that suggests icariin may function as a phosphodiesterase (PDE) inhibitor. Specifically, one in-vitro study demonstrated that it inhibits a particular PDE isoform, which is called PDE-5.

Why does this matter? You'll recall from the arginine review, that one of the functions of arginine is the production of nitric oxide, or NO. What NO does when it binds to a receptor is activate the enzyme guanylyl cyclase - which, in turn, manufactures a "second messenger" molecule known as cyclic guanosine monophosphate (cGMP). One of the downstream results of cGMP is the relaxation of vascular smooth muscle. This results in vasodilation and increased blood flow to the surrounding tissues. cGMP is degraded by PDE to 5'-GMP, which has no signalling function. There are 6 different PDE isoforms that occur in different tissues, but they all perform the same basic function.

This is the purpose of using arginine in supplements to boost NO: the idea is to increase NO signalling by making more NO. But there's another way to do it too: by inhibiting the breakdown of cGMP by blocking PDE.

Remember what I said about different PDEs in different tissues? The dominant isoform in the corpus cavernosum is PDE-5. Vasodilation of the corpus cavernosum is what causes an erection. Inhibiting PDE-5 facilitates an erection.

This is how Viagra works: sildenafil citrate is a PDE-5 inhibitor. So the take home from this is that icariin may be a sort of herbal Viagra. There are a few small animal studies that suggest that it also has this activity in vivo, although human studies need to be done. But it at least suggests that icariin, and perhaps horny goat weed, might have some sexual effects.

It is important to remember that Viagra and related compounds for the treatment of erectile dysfunction (ED) do not raise testosterone. T levels were even measured in one of the aforementioned rat studies and the researchers stated: *"Changes in ST* [serum testosterone] *were not significant"*. There is only one study that I found that found icariin had a testosterone-enhancing effect in rats, and the dose was enormous: 200 mg/kg! This is the equivalent of a 20 gram dose in a 100 kg human - of pure icariin, no

less. This makes it extremely unlikely that a small dose of horny goat weed extract standardized for icariin will have any impact on T levels.

What does the real world have to say?

Horny goat weed products get mixed reviews. This may be due to differences in product quality. In a recent Consumer Lab review of different products sold as sexual enhancers, two out of the four horny goat weed extracts tested contained only 31% and 52%, respectively, of the amount of icariin claimed on the label. And the other two products also failed testing due to unacceptably high levels of lead contamination.

Recommendations:

Of all of the herbal compounds sold as a libido booster, horny goat weed is possibly the most promising. It is also sold as a T booster, and that does not appear to be the case. People and supplement companies are fixated with testosterone. If some obscure study comes out showing some animals increased their sexual activity while taking X herb, they immediately start calling it a T booster and assume – versus prove – that's how it must be working.

So far, not one of the herbs that have a reputation as a libido booster (e.g., Tribulus, Long Jack, etc) have been shown to work as T boosters. Thus, just because you see an ad that claims some study found said herb made Sparky the red-eyed rodent extra horny does not by any means prove it's a T booster or that it's working through T as a mechanism of action. There is very little solid information on dose due to the lack of human studies, however, and the quality of the products leave a lot to be desired. Even if it does "work", it's not likely to have any significant impact on performance (in the gym, that is) or mass gains.

In my opinion, it may be worth a try for sexual effects, but it gets a thumbs down for boosting T, or increasing mass/strength.

To discuss Horny Goat Weed further, you can post in the Members' Area.

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"So far, not one of the herbs that have a reputation as a libido booster (e.g. Tribulus, Long Jack, etc.) have been shown to work as T boosters. Thus just because you see an ad that claims some study found said herb made Sparky the red-eyed rodent extra horny does not by any means prove it's a T booster or that it's working through T as a mechanism of action."

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Maca

Return to T.O.C.

What is it?

Maca (Lepidium meyenii) is a root plant native to Peru. It grows at very high altitudes (13,000-14500 ft above sea level) on the Andean plateaus of Peru. It's considered a medicinal food with many uses.

What is it supposed to do?

Maca is similar to ginseng in that it's considered an "adaptogenic" plant based supplement. Like ginseng in Asia, maca has been used for centuries in South America going as far back as 8000 BC during the Inca Empire. The concept of an adaptogen basically means that it helps the body adapt to higher levels of stress.

Unlike ginseng, however, maca is included in bodybuilding supplements due to its alleged aphrodisiac effects.

Maca contains several alkaloids that are said to "nourish" the endocrine glands, including the pituitary, adrenals, pancreas, testes and thyroid gland. Typical of adaptogenic substances, it is believed to have a wide range of effects that include increased strength and performance, increased sexual desire, improved mental acuity, improvements in people with chronic fatigue syndrome, as well as many other effects.

What does the research say?

The above effects are clinical observations in patients rather than the results found in controlled published studies. Unfortunately, there is scant published human research that confirms these clinical observations by doctors in Peru and other parts of the world. There are, however, a few interesting animal studies regarding growth and sexual desire.

One study found that cooked maca, but not raw maca, increased the weights of several generations of mice. They also found the serum values of total proteins and albumin were statistically superior for the mice group eating cooked maca than that of the raw maca and control groups. Does this make maca a true anabolic agent? At least in mice, it appears so but

further research is needed.

Another study in rats and mice examined maca's effects on sexual desire and erectile dysfunction. Interestingly, the study found the oral administration of a Maca extract enhanced the sexual function of the mice and rats. The researchers concluded:

"...the present study reveals for the first time an aphrodisiac activity of L. meyenii, an Andean Mountain herb."

"...the present study reveals for the first time an aphrodisiac activity of L. meyenii, and Andean Mountain herb."

Is Maca a true aphrodisiac? Only one small study exists in humans, where doses of 1.5 or 3.0 g/day of maca improved subjective evaluation of sexual desire. But a follow up study by the same researchers in Peru also determined that maca had no effect on testosterone levels. Is it a useful aid to athletes? Unfortunately, these questions can't be definitively answered at this time without better human data to support the animal studies.

What does the real world have to say?

On a personal note, I tried maca at very high dose (the manufacturer sent me a bunch and asked me to try it) and it did zilch for me. That's an n = 1 observation, so take it for what it's worth. I've heard very little feedback from others.

Recommendations:

Maca is a product to keep an eye on and may prove to be a worthwhile supplement to hard training athletes. However, due to its lack of any solid human data, it has to get a thumbs down. Might be worth trying for the heck of it, but I would not get your hopes up too high with this supplement.

To discuss Maca further, you can post in the Members' Area.

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Tongkat Ali (Long Jack)

Return to T.O.C.

What is it?

Tongkat Ali (Eurycoma longifolia Jack) also known as Long Jack, is an herb found in Indonesia. It contains compounds known as "quassinoids" such as eurycomalacton, eurycomanon, and eurycomanol as well as others.

What is it supposed to do?

Tongkat Ali (TA) is sold as a male sexual enhancer, muscle builder, and testosterone booster. It has a long history in Indonesia as a male sexual enhancer, with it being sold as a testosterone booster/muscle builder a more recent development.

What does the research say?

Studies in animals showing it increases sexual activity are extensive and compelling. There's many studies that find male rats given TA "do it" more then untreated groups of rats and mice. It seems to work well in young, middle aged, or old rats. Some of those studies are listed below in the reference section. Although interesting, sexual enhancement is not the focus of this e-book, so I won't take up much space discussing the topic.

The claims of TA being a testosterone booster and muscle builder are what is of interest, and where things get fuzzy from a research perspective. It seems researchers assumed TA was working via increased testosterone in male rats though they don't seem to have actually looked to see if there was an increase in testosterone in these animals, which is odd to say the least and slightly suspicious. There is mention of paper presented at the "Asian Congress of Sexology" claiming TA increases testosterone in men, but the paper could not be found.

It should also be noted that very high doses – between 200 mg/kg to 800 mg/kg of extract – were used in these studies with rats. The only study that even suggests TA has effects on testosterone and/or works via androgenic pathways examined the effects of TA on the laevator ani muscle in both uncastrated and testosterone-stimulated castrated intact male rats. At the highest dose (800 mg/kg) it was found that compared to controls, TA in-

creased the size of this muscle in rats that were both intact and castrated leading the researchers to conclude:

"Hence, the pro-androgenic effect as shown by this study further supported the traditional use of this plant as an aphrodisiac."

"Hence, the pro-androgenic effect as shown by this study further supported the traditional use of this plant as an aphrodisiac."

Finally, there was an abstract published in the British Journal of Sports Medicine that used real live humans and looked at TA's effects on muscle mass. The results were promising. The study found that 100 mg/kg of TA extract had statistically significant effects on lean body mass, body fat, and strength compared to controls. The study used fourteen men who were put on a strength training program for 5 weeks. The study found the group getting the extract had improved body composition, increased arm circumference, and increased one repetition maximum (1 RM), over the placebo group following the same exercise program. The researchers concluded:

"...results suggest that water soluble extract of Eurycoma longifolia Jack increased fat free mass, reduced body fat, and increased muscle strength and size, and thus may have an ergogenic effect. Further investigations are warranted."

"...results suggest that water soluble extract of Eurycoma longifolia Jack increased fat free mass, reduced body fat, and increased muscle strength and size, and thus may have an ergogenic effect. Further investigations are warranted."

What does the real world have to say?

Not much to report for feedback, but most people on my forums report no increases in muscle mass or strength.

Recommendations:

The above section on the studies might make one want to run out and buy a case of Long Jack. But wait! There's a bunch of red flags that go up regarding this supplement which should put the breaks on your enthusiasm. For example, the authors in the one study that did use humans and looked at actual changes in LBM and strength states:

"Thus, the objective of this study was to investigate the effect of the increase in testosterone levels, obtained by administration of ELJ, on body composition and muscle strength and size in man."

All well and fine, so why didn't they actually check their testosterone levels?! Why would one make such a statement then fail to actually look at testosterone levels? Nowhere in the abstract (and it was only published as

an abstract vs. as a full paper) do they mention any changes in testosterone, and that's very suspicious. I suspect they did test for testosterone and found no effects, and didn't want to publish that fact, but that's conjecture on my part. All those rat studies, and not one looked at testosterone? Again, something smells fishy… Other big red flags is the fact that if you look at the authors listed in all but one study, they come from essentially one group (Ang and company) from one location: School of Pharmaceutical Sciences, University Science Malaysia, Minden, Penang, Malaysia.

It's not uncommon at all for researchers to attempt to reproduce the effects of another groups findings and fail to get the same results. Anyone remember cold fusion?! HMB also suffered that fate: the people who developed it and had the license for it – which means they made all the $$$ from it - found it was the best thing since anabolic steroids, yet no one else could seem to reproduce the effects. Most of TA's research is published as odd abstracts or papers delivered to places like "the Asian Congress of Sexology." Anyone who has read enough research and knows the basics of research knows a smoke and mirrors group of studies when they see it. This is a shell game that makes TA look impressive "on paper" unless one really looks into it, at which point it's clear something is wrong with the big picture.

Products like this are problematic for me: do I recommend them due to the fact there is a lot of research or do I give it thumbs down because I feel the studies themselves are less then compelling? It's a rock and a hard place for yours truly. Keeping that in mind, due to the amount of research I am going to put TA in the "might be worth a try" category. However, I make that recommendation with considerable reservation due to the red flags mentioned above. Truth be known, I would not spend my money on it. It may be effective as a male aphrodisiac, but how it works (assuming it works at all) is far from clear at this time and companies selling it as a testosterone booster and muscle builder are full of you-know-what.

To discuss Tongkat Ali further, you can post in the Members' Area.

Click Here

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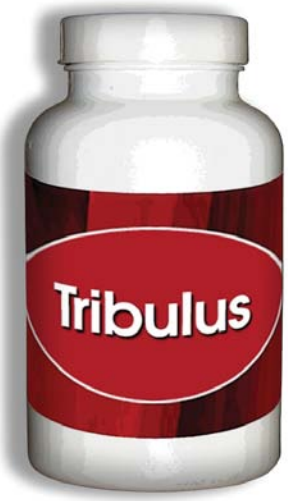
Tribulus terrestris

Return to T.O.C.



What is it?

Tribulus terrestris is considered a medicinal herb that has been used in many countries as a treatment for impotence and sterility. It's a plant that has been popularized over the years as a possible ergogenic for athletes.

What is it supposed to do?

Supplement companies have claimed it raises testosterone by raising luteinizing hormone (LH). The problem is that we have basically no modern research to go on with healthy athletes. Companies that sell Tribulus often have "in house" research that shows Tribulus raises testosterone but none of this research ever seems to see the light of day in Western peer-reviewed medical journals.

What does the research say?

There is in-vitro (test tube) research that suggests tribulus may improve the motility, function and total sperm count of animals. And there is some old Bulgarian research with athletes that supposedly showed improvements in strength and performance, but no modern published data showing either increases in testosterone or improvements in performance in athletes. In high enough amounts, some studies have found tribulus to be toxic to animals, but of course many things are toxic at high enough doses that normally present no dangers at lower doses.

At this point, companies marketing tribulus would be better off funding a real study to validate this product as it relates to athletes and testosterone levels, rather than spending the money on advertising.

There was one study in 2000 however, that found some interesting, albeit conflicting, effects with tribulus. Fifteen subjects were randomly assigned to a placebo or tribulus (3.21 mg per kg body weight daily) group.

Body weight, body composition, maximal strength, dietary intake and mood states were determined before and after an 8-week program of periodized weight training and supplementation. The study found there were

no changes in body weight, percentage of body fat, total body water, dietary intake or mood states in either group.

Muscle endurance increased for the bench and leg press exercises in the placebo group ($p < .05$; bench press +/-28.4 percent, leg press +/-28.6 percent), while the tribulus group experienced an increase in leg press strength only (bench press +/-3.1 percent, not significant; leg press +/-28.6 percent, $p < .05$).

"Supplementation with tribulus does not enhance body composition or exercise performance in resistance-trained males."

According to this study,

"Supplementation with tribulus does not enhance body composition or exercise performance in resistance-trained males."

Why the tribulus group got stronger in the leg press over the placebo group, considering the fact that it had no effects on LBM, fat mass, etc., remains unclear. A more recent study concluded that supplementation with 10 - 20 mg/kg body weight (1 - 2 grams for a 100 kg athlete) had no effect on serum androgen production.

What does the real world have to say?

Word on the street from users is mixed and this could be due to the quality of the herb, the quantity used, the physical state of the user or the possibility that it just does not work.

Recommendations:

Does all this mean tribulus is worthless to athletes? Perhaps not. It does mean that we don't have the kind of evidence we should have before making a recommendation on this supplement.

There is no doubt that as there are many herbs and compounds found within herbs that will turn out to be useful to athletes looking to improve strength, endurance and recuperation from tough workouts. And tribulus may turn out to be one of the herbs, but I would not hold my breath on that one.

So, where does this leave us? Personally, I would be cautious before parting with my money for the stuff. So far, the hype over tribulus far exceeds its worth to athletes. For increasing muscle mass or testosterone levels,

tribulus gets a thumbs down at this time.

To discuss Tribulus further, you can post in the Members' Area.

Click Here

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Phytochemicals

Return to T.O.C.

Higher testosterone levels are good for adding LBM, minimizing body fat, having a healthy libido, etc. but can have negative consequences too. Male pattern baldness, acne, oily skin, and benign prostatic hyperplasia are all potential consequences of increased testosterone due to conversion to DHT. So it's not surprising that there would be a market for compounds that might be anabolic without producing androgenic effects.

Herbs produce a vast array of biologically active substances that have been shown to have many different effects. Many function as antioxidants, inhibit the growth of cancer cells, affect neurotransmitter levels, enhance glucose control, reduce inflammation and perform other useful functions. It's conceivable then, that phytochemicals exist that could stimulate muscle protein synthesis or improve performance.

Ecdysterone

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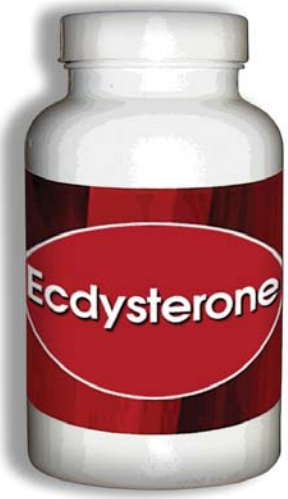

What is it?

Ecdysterone is in the phytoecdysteroids family of which there are approximately 200 plant steroids related in structure to the invertebrate steroid hormone 20-hydroxyecdysone.

Though similar in structure as steroids found in humans (i.e. testosterone) close does not cut it in reality. As the saying goes, "other than horse shoes and hand grenades, close does not count." What this means is that a steroid hormone has a very specific lock and key fit to its receptor and just because something looks like the same key does not mean it will fit the lock.

What is it supposed to do?

Claims for ecdysterone (beta-ecdysterone) suggest that it may increase protein synthesis in people and has been shown to improve performance in athletes.

What does the research say?

As a rule, western scientists have generally dismissed plant sterols as having any anabolic (muscle building) effects in the human body and consider the sale of such products as a scam and snake oil.

However, researchers in places like Japan and Russia have had a much more positive view of Ecdysterone and have come to the conclusion that they do have biological effect in humans and might be useful to athletes. Several Russian scientists I know, and various athletes, swear by certain products whose main ingredient are plant sterols, in particular, ecdysterone.

Though there is little doubt that most plant sterols have no anabolic effects in humans, does that mean all plant sterols have no effects in humans? Did we throw out the baby with the bath water by deciding all plant sterols had no effects in people? It's possible.

It has also been shown to increase protein synthesis in some animal models. However, it should be clearly noted that this research is from the afore-

mentioned countries and has never been confirmed by Western research, which is considered far more stringent. Not to mention the fact that animals are not people.

What does the real world have to say?

Whatever the value of ecdysterone, the fact remains that very few people taking commercial formulations have seen gains that can be attributed to the supplement. Most supplements contain fairly small doses, however. It's possible that larger amounts might be needed to see an effect.

"Whatever the value of ecdysterone, the fact remains that very few people taking commercial formulations have seen gains that can be attributed to the supplement."

Recommendations:

So what's the bottom line? At this time I see no reason to start running to the store to buy ecdysterone or any other product containing plant sterols for anabolic purposes.

However, it might also be wise to not close the door on this topic and be prepared to keep an open mind to the possibilities that some plant sterols, in particular ecdysterone, could be found to have some beneficial effects in humans. Much more research is needed, however.

Truth be told regarding this writer's feelings on the matter, I would not be holding my breath... For building muscle, ecdysterone gets a thumbs down at this time.

To discuss Ecdysterones further, you can post in the Members' Area.

Click Here

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Methoxyisoflavone

Return to T.O.C.

What is it?

Most people who follow sports nutrition or take supplements intended for the sports nutrition market, have probably heard of methoxyisoflavone (a.k.a. 5-methyl-7-methoxy-isoflavone) or "methoxy" for short. Methoxy is a plant-based compound in the family of compounds known flavanoids, which includes isoflavones, flavones, flavanones, naphthoflavones, as well as others.

This is a very large family of compounds, such as alpha-naphthoflavone, catechin, daidzein, equol, beta-naphthoflavone (BNF), quercetin, rutin, chrysin, genistein, ipriflavone, baicalein, quercetin, galangin, and biochanin.

Amazingly, there are far more of these compounds that I am not even listing! These plant-based compounds have a great range of effects, ranging from anti-cancer, antioxidant, and a thousand other potential uses still being elucidated by researchers as we speak.

What is it supposed to do?

A Hungarian company called Chinoin originally studied methoxy in the 1970s. The company has a patent on methoxy and lists its many effects on metabolism, including increased protein synthesis, increased lean mass, reduced body fat, promoted endurance, lowered cholesterol levels and an improvement in the body's ability to use oxygen.

The patent and supplement companies now selling methoxy claim this plant-based supplement has anabolic effects, working through non-hormonal pathways. That is, it achieves the above without using/affecting hormones such as testosterone, growth hormone, etc. Sound too good to be true? Does to me, too.

What does the research say?

Bodybuilders and other athletes have come to use the term "anabolic" to mean the building of muscle exclusively. This is only partly true. For example, physiology texts book will normally define anabolic or "anabolism"

as the phase of metabolism in which simple substances are synthesized into the complex materials of living tissue or a process by which larger molecules are formed from smaller ones.

What does this mean to the reader in English? It means that making new bone, or even fat, is in fact technically an anabolic endeavor.

Several companies have done research with isoflavones and found they may increase bone mass in animals and people. Does this mean methoxy affects bone and not muscle? Well, there is very little research with methoxy on healthy active adults that looked at muscle mass, other than the old Hungarian research, so it's hard to tell right now.

Several isoflavones, including methoxy, have been shown to increase the weight of many animals, but again, that effect appeared to be mostly increases in bone density. It should be noted that there is a great deal of research going on right now with hundreds of different plant-based compounds and the flavanoids are perhaps some of the most interesting and promising.

However, at this time, methoxy is far from the wonder anabolic supplement as it's being portrayed.

What does the real world have to say?

I have yet to meet anyone who's achieved any gains in LBM from the simple addition of methoxy. A few have claimed good results from using methoxy supplements, but these people are inevitably stacking multiple compounds and it's impossible to tell whether the results were actually obtained from using the supplement.

Recommendations:

Is methoxy a waste of money? Perhaps not, but its exact role in sports nutrition remains unclear, at best.

Considering the total lack of data showing any effects on muscle mass of healthy athletes, methoxy gets a thumbs down at this time.

To discuss Methoxyisoflavone further, you can post in the Members' Area.

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Beta-Sitosterol

Return to T.O.C.

What is it?

Beta-sitosterol is one of many sterol compounds derived from plants. It has structural similarities to cholesterol, which is produced in the human body and found pre-formed in various foods. Other sterols derived from plants are campesterol and stigmasterol which are collectively known as phytosterols.

What is it supposed to do?

Beta-sitosterol has a long list of claims, such as immune support, anti-inflammatory effects/pain relief, as a treatment for benign prostate enlargement/benign prostatic hyperplasia, cancer prevention, and as a way to treat high cholesterol levels in humans. In the sports nutrition arena, the claim has been that, due to its structural similarities to cholesterol and other compounds, it builds muscle, since cholesterol is a precursor to anabolic hormones such as testosterone. Some companies selling this compound claimed that, like cholesterol, it's a precursor for testosterone, while others have claimed it has direct effects beyond conversion to testosterone. Finally, the plant sterol is claimed to prevent the conversion of testosterone to DHT, which is a potent androgen associated with various problems, such as male pattern baldness and prostate enlargement.

What does the research say?

Because the claims for beta-sitosterol (BS) are so varied and the research so extensive, we will stick mostly to the claims germane to this book. Research showing BS improves strength, performance, or muscle mass in humans is essentially non-existent. Interestingly, some studies do suggest high doses of BS fed to animals can alter or increase testosterone production - as well as estrogen (estradiol), which is not necessarily a good thing. However, studies that fed BS to humans didn't find any increase in testosterone.

Other claims for BS are much better supported and compelling. Studies do find it may decrease LDL cholesterol, improve the symptoms of benign prostate enlargement, modulate immune function, reduce the production of inflammatory cytokines, and have anti-cancer effects. For example, ani-

mals studies find reductions in tumor growth and reduced metastasis of breast cancer cells when the animals are fed BS. Due to this compelling research on its cholesterol lowering effects, food companies are adding it to margarine and other food stuffs.

More relevant to athletes, data suggests BS may inhibit the post-exercise immune suppression that occurs following intense exercise and possibly suppress the catabolic hormone cortisol. All of these effects mentioned above need further investigation however. A simple reduction in some hormone does not automatically = increased muscle mass or strength. Many nutrients have been shown to reduce cortisol levels (e.g., vitamin C) yet don't appear to do jack sh*& for muscle mass directly. Research suggests BS is quite safe with no known toxicity.

"A simple reduction in some hormone does not automatically = increased muscle mass or strength. Many nutrients have been shown to reduce cortisol levels (e.g. vitamin C yet don't appear to do jack sh*& for muscle mass directly."

What does the real world have to say?

Although I have gotten some positive reports from men using BS for prostate enlargement, no one has ever reported effects such as increased strength, muscle mass, or performance.

Recommendations:

BS appears to be one of many compounds found in plant-based foods that have potentially positive health benefits. It may be one of several reasons why people who eat more fruits, vegetables, nuts, etc experience a reduction in various diseases. From an athlete's point of view, the possible effects on cortisol/prevention of post-workout immune suppression may be of interest. However, there is no evidence at all that BS will improve strength, body composition, or performance in any way.

As a testosterone booster, it's a waste of money. As a general health supplement, studies suggest some benefits. Another possible use as it applies to athletes are the studies that suggest SB can block the conversion of testosterone to DHT, and that may have some applications in treating or preventing male pattern baldness and other DHT related issues, but it's far from well researched or proven to have any benefits in this area.

The range of recommended doses is quite wide: from as low as 60 mg to as high as 40 g, with 1 - 3 g being average. The optimal dose for effects on cholesterol, immunity, or benign prostate enlargement is unclear.

As a general health supplement or as a possible treatment for high cholesterol, BS gets a thumbs up. As a supplement for altering body composition or increasing strength, there are better places to spend your hard earned money.

To discuss Beta-Sitosterol further, you can post in the Members' Area.

Click Here

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Adaptogens

Return to T.O.C.

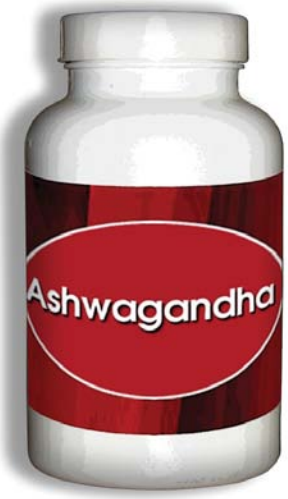
Adaptogens are compounds extracted from plant sources that improve resistance to stress. Resistance exercise imposes considerable physical stress that requires a certain amount of rest and recovery to avoid overtraining and injury. Everyday life also imposes a certain amount of mental and physical stress, that can take a toll on recovery.

Excessive stress can lead to overproduction of catabolic hormones like cortisol, depressed immunity, and poor performance. There are potential benefits then, to supplementing with compounds that might improve recovery or the ability to cope with increased stress.

The adaptogenic compounds on the market today are a part of traditional folk medicine in countries like China, Korea, and Russia. Several have been researched for use by Russian athletes, but have not been extensively evaluated by Western peer-reviewed research.

Ashwagandha

Return to T.O.C.



What is it?

Ashwagandha is Withania somnifera, a medicinal plant used in traditional Ayurvedic medicine. The name means "smells like a horse", because of the characteristic odor. It's also known as "Indian Ginseng" although it is not related to true ginseng.

What is it supposed to do?

Ashwagandha is used to treat a variety of ailments in Ayurvedic medicine. In bodybuilding supplements, extracts of Withania are supposed to improve stamina and reduce cortisol levels. Ashwagandha is also found in "thyroid support" formulas.

What does the research say?

Most of the studies on Ashwagandha have been performed in rats and mice. In one study, for example, administration of 2.5 mg/kg of an isolated "Withanolide" compound, 1-oxo-5beta, 6beta-epoxy-witha-2-ene-27-ethoxy-olide, resulted in reduced indices of stress from exposure to cold, hypoxia, and restraint. Another study found that the stress-related responses (glucose intolerance, increase in plasma corticosterone levels, gastric ulcerations, male sexual dysfunction, etc.) of rats exposed to random foot shocks were attenuated by 25 - 50 mg/kg doses of Withania, administered 1 hour before.

Ashwagandha may also have anti-depressant effects. One study demonstrated that daily doses of 20 and 50 mg/kg of the withanolide fraction had similar effects to the benzodiazepine drug lorazepam on rat behavior in "elevated plus-maze, social interaction and feeding latency in an unfamiliar environment" tests.

Some of its positive effects may be due to its antioxidant activity. Rats given injections of 10 - 20 mg/kg of glycowithanolides for 21 days, had increased levels of endogenous antioxidants (superoxide dismutase, catalase and glutathione peroxidase) in their brains.

There are also antimicrobial, antiosteoporotic, antitumor, neuroprotective and immune-stimulating properties. Feeding 0.75 - 1.5 g/day of the root powder to rats also reduced cholesterol in hypercholesterolemic rats.

One of the more interesting properties of Ashwagandha may be its ability to increase levels of thyroid hormones. Mice gavaged with 1.4 g/kg root extract for 20 days had increased serum levels of T3 and T4, along with reduced hepatic lipid peroxidation. There is even a case report of thyrotoxicosis in a woman taking a supplement containing Ashwagandha.

As I've often pointed out, rats and mice aren't people. While these studies look interesting and support the traditional use of the herb, they're far from conclusive. There are very few human studies that provide any indication of benefits to health or performance at doses normally found in bodybuilding supplements.

One of the few human studies involved an Indian commercial supplement, RA-11, which is used to treat arthritis. The 32-week trial demonstrated significantly reduced pain and increased knee function in patients receiving the supplement vs. those receiving the placebo. One flaw, however, was that RA-11 contains several other herbs in addition to Ashwagandha, so it's difficult to draw firm conclusions from this clinical trial.

"While these studies look interesting and support the traditional use of the herb, they're far from conclusive. There are very few human studies that provide any indication of benefits to health or performance at doses normally found in bodybuilding supplements."

What does the real world have to say?

Feedback on this herb has been limited, but mildly positive. There don't appear to be any real benefits to performance, although some users report feeling a greater sense of well-being and/or improved memory.

Recommendations:

On paper, Ashwagandha seems like interesting stuff, but it may be that the limited amounts consumed in many commercial supplements are inadequate to produce any real results. Or it could be simply that the rat studies simply don't extrapolate well to people.

In general, this herb is not expensive, so it might be worth a try for overall mood and/or cognition, although it gets a thumbs down for lean mass/performance. It appears to be fairly safe when taken in recommended doses (3 - 6 g/day of the dried root, or 300 - 500 mg of a standardized extract). There are potential GI symptoms in higher doses, not to mention the case

report of thyrotoxicosis mentioned above.

To discuss Ashwagandha further, you can post in the Members' Area.

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Bacopa monnieri

Return to T.O.C.

What is it?

Bacopa monnieri is another Ayurvedic medicinal herb, traditionally known as "Brahmi." It's been used for several centuries to treat anxiety and depression, as well as enhance cognition and memory. A number of biologically active compounds have been identified, and are known collectively as "bacosides."

What is it supposed to do?

Bacopa extracts are added to bodybuilding supplements to decrease mental fatigue and assist recovery due to the herb's reputed anti-stress and known antioxidant activities.

What does the research say?

As with Ashwagandha, there is a fair amount of research on the properties and activities of Bacopa monnieri. Unfortunately, most of the work has been done using either rodent or in-vitro (test tube) models. What there is, however, makes it clear that Bacopa contains some interesting and pharmacologically active compounds.

One study on rats, for example, demonstrated that pretreatment with 80 mg/kg of a standardized Bacopa extract reduced the physiological changes associated with both acute (1 day) and chronic (7 day) immobilization stress. Another rat study demonstrated that doses of 20 and 40 mg/kg bacosides for 7 days prior to stress altered the expression or activities of certain enzymes in their brains. The researchers hypothesized that the alterations might allow *"... the brain to be prepared to act under adverse conditions."*

Other studies on memory and cognition have demonstrated that Bacopa monnieri may help prevent dementia. A study in mice showed it improved learning following treatment with scopolamine, while another had similar results following treatment with phenytoin. A recent study found that doses of either 40 or 160 mg/kg/day of Bacopa extract reduced the formation of amyloid plaques in a mouse model of Alzheimer's Disease.

Some human studies have also been conducted. An Australian test showed that chronic use of a "Brahmi" preparation on 76 adults between 40 and 65 years of age showed *"... a significant effect of the Brahmi on a test for the retention of new information."* A similar conclusion was reached by a different group of researchers who gave their test subjects a daily dose of 300 mg/kg Bacopa extract for 12 weeks. They wrote:

"B. monniera significantly improved speed of visual information processing measured by the IT task, learning rate and memory consolidation measured by the AVLT (P<0.05), and state anxiety (P<0.001) compared to placebo, with maximal effects evident after 12 weeks...These findings suggest that B. monniera may improve higher order cognitive processes that are critically dependent on the input of information from our environment such as learning and memory."

On the other hand, a study using a commercial supplement containing 300 mg Bacopa extract and 120 mg Gingko biloba for 4 weeks concluded that the extracts:

"... did not demonstrate any significant effects on tests investigating a range of cognitive processes including attention, short-term and working memory, verbal learning, memory consolidation, executive processes, planning and problem solving, information processing speed, motor responsiveness and decision making."

Why the difference? It may be due to the quality of the extracts in commercial formulations. One recent analysis found that:

"The total saponin content in the samples, plant materials and extracts varied from 5.1 to 22.17% and 1.47 to 66.03 mg/capsule or tablet in the commercial formulations."

Several other animal studies have also found Bacopa extracts possess antioxidant, anti-inflammatory, hepatoprotective, gastroprotective and neuroprotective effects. A high dose of 200 mg/kg also increased thyroid (T4) hormone levels in mice.

What does the real world have to say?

A few reviews I've seen for certain standardized Bacopa extracts suggests it has a relaxing quality. Some feel it helps with anxiety. This is in line with

"B. monniera significantly improved speed of visual information processing measured by the IT task, learning rate and memory consolidation measured by the AVLT (P<0.05), and state anxiety (P<0.001) compared to placebo, with maximal effects evident after 12 weeks...These findings suggest that B. monniera may improve higher order cognitive processes that are critically dependent on the input of information from our environment such as learning and memory."

its traditional use. There is no indication, however, that it helps w/physical performance.

Recommendations:

Bacopa seems to have more nootropic than performance effects. It may be worth a try for people interested in that sort of thing, although there are probably better supplements to take for concentration and focus in the gym. For those who are interested, a recommended dose is 200 - 400 mg for an extract that is standardized to 20% bacosides.

To discuss Bacopa monnieri further, you can post in the Members' Area.

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Ginseng

Return to T.O.C.

What is it?

Ginseng is the dried root of several different species of herbs in the Panax genus. Chinese or Asian Ginseng is Panax ginseng; while American Ginseng is Panax quinquefolius L. Siberian or Russian Ginseng is actually a different, distantly-related plant, Eleutherococcus senticosus, and contains different active compounds. Any or all of these might be included in commercial ginseng supplements.

What is it supposed to do?

Ginseng has been used in the Orient for centuries as an "adaptogenic" plant based supplement. The concept of an adaptogen basically means that it helps the body adapt to higher levels of stress.

The ailments Ginseng is claimed to treat range from nervous disorders, anemia, poor libido, wakefulness, forgetfulness and confusion, nausea, chronic fatigue, and angina, to name a few.

What does the research say?

Exactly how ginseng supposedly accomplishes all this is unclear and still being investigated. In animals, ginseng appears to have positive effects on the cardiovascular system, central nervous system, endocrine system, metabolism, and immune system. However, several recent reviews that examined the data on ginseng concluded, that while studies with animals show that ginseng (or its active components) may have positive effects on health and performance, there is generally a lack of controlled research demonstrating the ability of ginseng to improve performance in humans.

The general consensus regarding the effects of ginseng in humans is that most studies suffer from methodological problems such as inadequate sample size and lack of double blind, control and placebo designs. However, Germany's Commission E, which is responsible for developing guidelines for herbs, has found that ginseng is useful for a wide variety of problems, such as fatigue and improving mental concentration. Europeans seem to have a much better handle on the uses of ginseng than the US.

To the reader, the above may seem confusing or contradictory. The reason for the contradictory information may be due in part to the type of ginseng being used, the quality of the ginseng being used, the amount of the ginseng used, and the aforementioned study design problems.

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For example, different varieties of ginseng are reported to have different effects. Also, many ginsengs on the market are known to be lacking in the active ingredients. In true ginseng these are known as "ginsenosides"; similarly, the active compounds in Siberian Ginseng are known as "eleutherosides".

One study found that over 85 percent of ginseng products on the shelves contained virtually no ginsenosides. This makes ginseng something of a confusing supplement for athletes, but not a supplement without potential merit. One recent study, for example, found 350 mg of ginseng extract improved the reaction time (psychomotor performance) of soccer players over a six week period.

Overall, studies on ginseng and athletic performance have yielded mixed results, with some studies showing modest improvements in endurance and time to exhaustion, while others show no effect.

Some studies have found ginseng has powerful anti-cancer and antioxidant properties, as well as an ability to improve blood sugar metabolism. One recent study found ginseng was able to treat some men with erectile dysfunction!

This may be due to ginseng being possibly able to effect nitric Oxide (NO) production in men, as NO is essential for obtaining an erection.

What does the real world have to say?

By some accounts with users, various ginseng preparations seem to increase stamina, concentration and resistance to stress, as well as improvements in endurance. Others report no discernable effects.

Recommendations:

The use of ginseng continues to grow with current sales estimated to be approximately 300 million dollars annually. There is clearly a need for research dealing with the efficacy of ginseng. This research needs to take

into account basic, fundamental design considerations if there is to be any hope of establishing whether or not ginseng actually has a place in an athletes supplements regimen. It's hard to imagine a billion Chinese could be totally wrong about ginseng however...

What is the optimal dose? Different extracts contain differing amounts of the active ingredients. Different products contain different doses. General recommendations are commonly 50 - 100 mg per day of an extract containing at least 7 percent -10 percent ginsenosides, 2 - 3 times per day.

Some experimentation may be needed however. What about building muscle? There is not a drop of solid data to support such a use for ginseng. So, an athlete looking to build muscle or increase performance, ginseng gets a thumbs down.

To discuss Ginseng further, you can post in the Members' Area.

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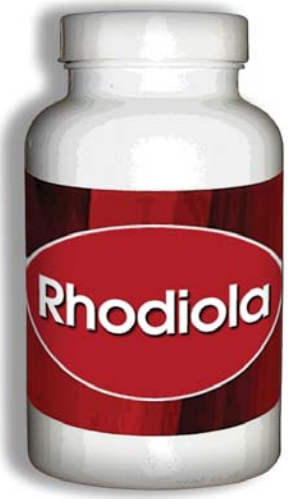
Rhodiola rosea

Return to T.O.C.



What is it?

Rhodiola rosea is a popular traditional medicinal plant in Eastern Europe and Asia. It contains a number of biologically active compounds, which include salidroside, p-tyrosol, and what are collectively known as "rosavins".

What is it supposed to do?

Rhodiola preparations have been used to reduce fatigue, prevent high-altitude sickness, and treat depression. Rhodiola extracts in bodybuilding supplements are supposed to reduce the effects of stress and enhance recovery.

What does the research say?

Rhodiola rosea has been extensively researched in Eastern Europe. Unfortunately, much of the work has been published in obscure (mostly) Russian-language journals and has not been evaluated by the standards of Western, peer-reviewed science.

One study published in the International Journal of Sports Nutrition and Exercise Metabolism found that acute intake of 200 mg Rhodiola extract standardized for 3% rosavins and 1% salidroside modestly increased the endurance exercise capacity in young, healthy volunteers.

Other studies have shown limited, but positive results. One study using simulated high-altitude conditions showed that supplementation with Rhodiola extract tended to decrease the formation of free radicals produced under hypoxic stress. A second study demonstrated an anti-inflammatory effect in the muscles of untrained volunteers participating in exhaustive exercise.

Other human studies, however, have shown no effects on performance. Two studies using commercial supplements containing Rhodiola extracts as a part of a blend showed no significant impact on cycling performance.

Animal studies suggest that Rhodiola rosea possesses possible adapto-

genic activity. One study in mice showed that a standardized extract (3% rosavins, 1% salidroside) had adaptogenic, antidepressant and stimulating effects when given at doses ranging from 10 - 20 mg/kg. Another found that 50 mg/kg Rhodiola extract increased the time to exhaustion of swimming rats.

Rhodiola extracts have been found to improve glycemia and increase the levels of endogenous antioxidant enzymes in the livers of diabetic rats.

Other interesting properties have emerged from in-vitro (test tube) work. Rhodiola extracts may have some anti-hypertensive, anti-tumor, and antimicrobial effects.

What does the real world have to say?

User feedback has been generally positive for extracts that have been standardized for 3% rosavins. People who use it feel it seems to help with overall mood and reduction of fatigue.

Recommendations:

Rhodiola does not appear to be much of a performance-enhancer, although I suppose it might be "worth a try" for overall resistance to fatigue. If you should decide to try it, look for a supplement that provides at least 100 - 200 mg of an extract standardized to 3% rosavins.

To discuss Rhodiola rosea further, you can post in the Members' Area.

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Miscellaneous Compounds

Return to T.O.C.

This is a diverse group of compounds that don't fit neatly into any of the previous categories, but are nonetheless part of the bodybuilding pharmacopeia. This group includes:

- Caffeine
- GH Supplements
- Glycerol
- MCTs
- Myostatin Inhibitors
- Saw Palmetto

Each one is marketed to improve either body composition or performance through a variety of different mechanisms. How each one works - or is supposed to work - is covered in the following pages.

Caffeine

Return to T.O.C.

What is it?

Caffeine is 1,3,7-trimethylxanthine, a naturally-occurring alkaloid in coffee, tea, and chocolate, as well as an additive in a number of commercial beverages, over-the-counter drugs, and supplements.

What is it supposed to do?

Caffeine is a stimulant that exerts a variety of physiological effects. Most of caffeine's major effects stem from its action as an adenosine receptor antagonist. When adenosine binds to receptors on the surface of neurons in the brain, neuronal activity slows down. By blocking those receptors, caffeine keeps neurons firing and facilitates the release of stimulatory neurotransmitters like adrenaline and noradrenaline, hence the "pick me up" sensation people get from a cup or two of coffee.

Caffeine exerts both positive and negative effects: it can increase thermogenesis, mitigate fatigue, enhance cognitive function, and improve athletic performance. It can also increase heart rate and blood pressure, cause insomnia, and - in sensitive individuals - induce gastrointestinal distress, anxiety, irritability, and other side effects.

One of the major downsides of caffeine is the fact the body becomes tolerant to chronic caffeine intake fairly quickly, and caffeine withdrawal can produce unpleasant symptoms such as headache, fatigue, and even nausea.

What does the research say?

Caffeine is one of the most heavily researched compounds in the world, and to give a full summary is beyond the scope of this review, which will focus on its effects on athletic performance and body composition.

Caffeine enhances exercise by delaying exercise-induced fatigue. In one cycling trial, for example, ingestion of 330 mg of caffeine 60 minutes before the test increased the time to exhaustion from an average of 75.5 minutes to 90.2 minutes. Another study showed that 250 mg x 2 doses of caffeine

(one taken 60 minutes before exercise, the other consumed over the first 90 minutes of the exercise) showed a 7.4% increase in work production, and a 7.3% increase in VO_2max. To take another example, runners consuming 4.45 mg/kg caffeine were able to increase their time to exhaustion by 7.5 - 10 minutes.

While caffeine does not appear to enhance strength performance, it has significant effects on mood and concentration. Subjects consuming caffeine are also able to perform more total work for the same level of perceived effort. This explains its popularity as a pre-workout supplement for strength athletes as well as endurance athletes.

One issue that has come up in recent research is the possible impact of caffeine on insulin resistance. A small study in 2002 demonstrated a 15% decrease in insulin sensitivity in lean, healthy volunteers who received a bolus of 3 mg/kg intravenous caffeine, followed by a steady infusion of 0.6 mg/kg for the duration of the experiment. Another study on lean, sedentary, nonsmoking men showed a 24% reduction in glucose uptake and a 35% decrease in carbohydrate storage. Still another study showed that the reductions in insulin sensitivity persisted with caffeine ingestion, in spite of a three-month aerobic exercise program, which might otherwise have improved insulin sensitivity.

There are several things to keep in mind:

- none of these studies have been conducted on athletes, but relied on measurements of sedentary individuals for the most part. The one study that did look at exercise started with sedentary individuals and used "walking or light jogging on a treadmill for 60 min, five times per week at a moderate intensity (60% VO_2max)" as the sole form of exercise. So very fit people with potentially better insulin sensitivity have not been studied.

  In support of this point, a study conducted by Thong et al., demonstrated that exercise did, in fact, improve post-caffeine insulin action. This study, however, used "...healthy, moderately active men" and used a one-leg knee extensor exercise protocol to look at insulin action in the exercised vs. non-exercised muscle.

- all the studies looked at acute effects of caffeine ingestion, not chronic. Yet habitual caffeine intake induces tolerance to many of its effects. So none of the studies conducted so far tells us anything about chronic

caffeine use, such as would be the case with using caffeine as a pre-workout stimulant or in an EC combo for fat loss.

- The studies looked at the use of pure caffeine only, not consumption of caffeinated beverages, such as coffee. Furthermore, the doses were often quite high: 5 mg/kg, for example, is the equivalent to 500 mg for a 100 kg man. This is 2.5 times the amount in most caffeine-containing supplements (200 mg).

- According to Thong, et al., "*...the inhibitory effects of caffeine on glucose uptake occur only in the presence of high insulin levels*" - so the impact of caffeine intake is likely to be mitigated by a diet with a low glycemic index, as recommended in this e-book, as well as "Fat Loss Revealed."

So there is still plenty of room to debate the effects of chronic caffeine consumption on insulin sensitivity in athletes.

As alluded to above, the effects of drinking naturally caffeinated beverages like coffee makes it even more complicated. As it turns out, epidemiological studies have shown that coffee consumption may reduce the risk of developing diabetes as well as Metabolic Syndrome/Syndrome X! A recent review, "Coffee, Diabetes, and Weight Control" suggests that this may be due to the presence of non-caffeine components in coffee that counteract the effects of caffeine. Coffee contains chlorogenic acid and quinides which both enhance insulin sensitivity and glucose clearance in experimental animals. As the authors point out:

"It is not known whether tolerance develops to the effects of...other coffee compounds that have the ability to enhance insulin sensitivity. It may be that such tolerance does not develop, even though tolerance to caffeine's ability to depress insulin sensitivity does develop. If tolerance to the noncaffeine compounds does not develop, that could help explain the apparent contradiction between the long-term epidemiologic finding that coffee enhances glucose tolerance and the short-term finding that coffee impairs glucose tolerance."

As is often the case, more research will be needed to clarify these points.

Another point of confusion concerning caffeine is the ongoing debate about whether or not caffeine interferes with creatine supplementation. The evidence that it does comes from two small studies performed by the same research group that concluded that caffeine completely negated the

"It is not known whether tolerance develops to the effects of...other coffee compounds that have the ability to enhance insulin sensitivity. It may be that such tolerance does not develop, even though tolerance to caffeine's ability to depress insulin sensitivity dies develop. If tolerance to the noncaffeine compounds does not develop, that could help explain the apparent contradiction between the long-term epidemiological finding that coffee enhances glucose tolerance and the short-term finding that coffee impairs glucose tolerance."

ergogenic effects of creatine use. These studies are generally not well-regarded and have not been replicated. In both, fairly large doses of caffeine were used: 5 mg/kg. Neither study actually looked at the effects on performance in a typical strength workout: the first used a series of extremely high repetition knee extensions; while the second looked at muscle relaxation times after electrical stimulation.

The funny thing is that many of the early studies looking at the positive effects of creatine supplementation on performance, used creatine dissolved in caffeine-containing beverages such as coffee and tea. So there may be a threshold for caffeine intake before it interferes with the effects of creatine - assuming, of course, that it has an effect at all.

For the record, people take caffeine and creatine all the time: lots of people are coffee drinkers, and/or take other caffeine-containing supps (many NO supps, diet supps, and other pre-workout energizers like Red Bull) contain solid doses of caffeine). And quite a few take EC as well. I've yet to hear of anyone complain about any conflicts.

Thus, I'm inclined to not take the advice to avoid caffeine + creatine very seriously, pending of course, confirmation by some other group, using a study design that lends itself to drawing better real world conclusions.

What does the real world have to say?

Caffeine is - to put it mildly - ubiquitous. It's in coffee, tea, and chocolate; it's in over-the-counter medications; it's included in the aforementioned energy drinks and supplements. I include a strong black cup of coffee in my pre-workout stack. Thousands of people use ephedrine and caffeine combos to lose excess fat. Most see caffeine as a benign, and often useful adjunct to their programs.

Recommendations:

Caffeine is certainly useful as a workout energizer and ergogenic aid. As with any pharmacologically active compound, there are a few minuses to go along with the pluses. Certainly some people are sensitive to it, and prefer to avoid it - although as far as this writer is concerned, there is no sunshine without coffee! There are also some lingering questions about its role in reducing insulin sensitivity, but considering the large number of lean, healthy athletes who use it, my hunch is that future research will show

that tolerance due to chronic use minimizes this problem - especially for people who are active and consume a healthy, low-GI diet. So caffeine still rates two thumbs up for athletes, at least in moderate amounts.

To discuss Caffeine further, you can post in the Members' Area.

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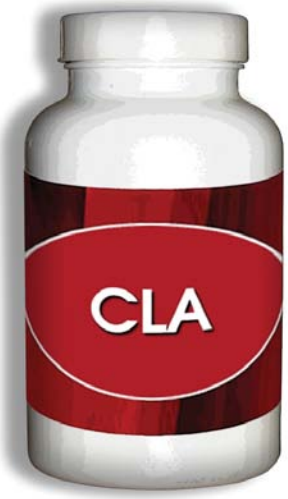
CLA (Conjugated Linoleic Acid)

Return to T.O.C.



What is it?

CLA (Conjugated Linoleic Acid) is found predominantly in dairy products and it appears to be a fatty acid with some unique effects on the metabolism of animals and (hopefully) people. CLA is not a single substance: rather, it's a series of isomers of linoleic acid with conjugated bonds ("conjugated" = two double bonds separated by a single bond). The CLA found in milk/meat is predominantly the cis-9, trans-11 isomer (also known as "rumenic acid"). Commercial supplements, on the other hand, are a mixure of isomers, dominated by the cis-9, trans-11 and trans-10, cis-12 isomers.

What is it supposed to do?

As readers of this e-book may recall, we have looked at the topic of lipids/fats in sports nutrition, fat loss, etc. and come to the conclusion that not all fats are "bad" and some may help performance, body fat levels and strength. Conjugated Linoleic Acid (CLA) may very well be just such a fat.

What does the research have to say?

Several in-vitro (test tube) and animal studies have shown it has powerful antioxidant properties as well as impressive anti-cancer properties. It has been shown to modulate insulin-like growth factor binding proteins (IGFBP's) in mice and may also improve insulin sensitivity.

It has been shown to suppress the growth of certain lines of human breast cancer as well as several other cancers. Animals subjected to various cancer causing chemicals and fed CLA appear to fare much better than those not getting CLA. Some studies with CLA also point to this lipid as a possible immune enhancer.

"This is all very interesting and wonderful, but I want to know what it can do for athletes?" the reader is thinking. Well, since this is a sports nutrition oriented book we will stick to that angle. Perhaps more relevant and interesting to athletes, CLA has been found to be the best thing for building muscle and losing fat in mice and rats since they slipped anabolic steroids in their mouse food!

A substantial number of studies has confirmed that animals (the aforementioned squeaky things with red eyes) add lean body mass in the form of muscle and lose body fat when fed CLA, making CLA a true anabolic agent in rodents.

"Ok," we are all thinking, "Lots of things work on mice and rats but this doesn't seem to do a thing for us higher animals lifting weights." That is true. And like many supplements, the human data are lacking; yet growing steadily. The good news is we have a few notable human studies. The bad news is they continue to be conflicting in their findings.

Pertaining to building muscle, research was presented at a large conference in Lahti, Finland recently by a Dr. Lowery. The study fed 24 novice bodybuilders 12 grams of a product containing 7.2 grams of CLA or placebo (vegetable oil) while completing a 6 week program of bodybuilding exercises.

The study found the group getting CLA had an increase in strength and arm girth (their arms got larger) but did not add body fat leaving the researchers to conclude, "apparently, CLA acts as a mild anabolic agent in novice male bodybuilders." One recent study found that CLA supplementation at 3-4 grams per day caused an almost one inch reduction in waste size and a loss of body fat of 2-4 lb. in overweight subjects over a 12 week period.

Additonal studies have also shown positive effects. One long-term study on 134 overweight men and women showed statistically significant fat loss over the first 6 months of a 24 month study. The study also demonstrated that fat-free mass was preserved, and that the dose of CLA supplied (3.4 g/day) was safe and had no long-term adverse effects. Another 6-month-study on 40 overweight subjects receiving 3.2 g/day CLA had similar results. A study on twenty normal weight, exercising volunteers also showed statistically significant fat loss using 1.8 g/day CLA for 12 weeks.

However, a pilot study using weight lifters found no differences in body weight, fat, or muscle mass over a 30 day period. Another small study with ten subjects, receiving 3 - 4 grams of CLA versus 10 subjects getting a placebo for three months, found similar results. A third study of 17 healthy women getting 3 grams of CLA versus placebo (sunflower oil) for 64 days, found no statistically significant differences between the two groups.

To complicate the picture, other research has suggested that CLA can a)

enhance the formation of inflammatory cytokines; b) have unfavorable effects on blood lipids; and c) increase insulin resistance. These effects appear to be isomer-specific. For example, one study showed that the trans-10, cis-12 isomer increased insulin resistance by 19% and reduced HDL cholesterol in men with abdominal obesity.

Studies on supplementation with the mixed isomers, however, do not appear to produce such detrimental changes. One recent study on 41 healthy overweight adults published in the International Journal of Obesity concluded that after 6 months of supplementation:

"CLA does not affect glucose metabolism or insulin sensitivity in a population of overweight or obese volunteers."

"CLA does not affect glucose metabolism or insulin sensitivity in a population of overweight or obese volunteers."

This was echoed by the researchers in the 24 month safety study mentioned earlier who concluded:

"CLA was well tolerated and the observed changes in the safety variables were all within the normal range, suggesting that CLA supplementation in healthy, overweight subjects for 24 mo is safe."

"CLA was well tolerated and the observed changes in the safety variables were all within the normal range, suggesting that CLA supplementation in healthy, overweight subjects for 24 mo is safe."

Yet another study on healthy, overweight volunteers using 6 g of CLA in the form of a commercial supplement (Clarinol) for 12 months also concluded that there were no adverse effects on blood glucose, lipids, or insulin levels.

What does the real world have to say?

Feedback from users has been mixed, although there are people who feel they've gotten positive results from using CLA. Although many of the human studies have used ~ 3 g a day, the most positive comments have come from those using 6 - 7 g/day.

Recommendations:

Although some of the findings with CLA in people have been exciting and interesting, there continues to be too many conflicting studies. Though it may turn out to be a worthwhile supplement for athletes, far more human research is needed for definitive conclusions, but CLA is a supplement to keep an eye on.

For increasing muscle mass or improving performance, it gets a thumbs down until more human research is done. As a fat loss agent, it may be worth a try but again, research is conflicting at best. At this point, even though I am giving it a thumbs down for building muscle, I consider it one of those "might be worth a try" supplements.

To discuss CLA further, you can post in the Members' Area.

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GH Supplements

Return to T.O.C.

What are they?

There is a long list of supplements being sold claiming to be either Human Growth Hormone (HGH or GH), or to cause the release of GH. The number of nutrients claiming to be able to increase HGH levels is long.

The major products in this category currently being, marketed can be broken down into three major categories however.

- Homeopathic GH claiming to contain actual HGH
- Growth hormone promoting nutrients (certain amino acids, vitamins, etc.)
- Secretagogues, short peptides that supposedly, cause a release of GH.

What are they supposed to do?

The GH supplements are one of the few supplements covered in both e-books (Fat Loss Revealed and Bodybuilding Revealed), as they are perceived by people to both increase LBM and or decrease body fat.

What does the research have to say?

The role of GH in the human body is extensive and rather complicated with many effects still being elucidated. GH is known to play an essential role in the regulation of body fat levels, immunity, muscle mass, wound healing, bone mass, and literally thousands of other functions both known and yet unknown. Real human GH is a peptide 191 amino acids long with a molecular weight of approximately 20,000.

It is produced by the anterior pituitary gland, located at the base of the brain. The bulk of the effect accomplished by GH is performed by a related hormone (Insulin-like Growth Factor-1 or IGF-1), which is released predominantly by the liver and, to some extent, by other tissues in response to GH levels. However, some recent data suggest GH has effects separate from that of its relation to IGF-1.

It is well-established that GH levels steadily decline as we age and is par-

tially responsible for the steady loss of muscle mass, loss of skin elasticity, immune dysfunction, and many other physical changes that take place in the aging human body. Explaining in detail the many roles GH plays in the human body is beyond the scope of this e-book.

Research with GH has been both interesting and conflicting. However, the bulk of research with actual injections of GH is compelling. In populations that have reduced GH levels – such as the elderly – injections of GH have been shown to: increase skin thickness and elasticity, improve healing time and reduce infection rates after surgery, decrease body fat, increase muscle mass, increase bone density, improve cholesterol levels (by decreasing LDL cholesterol and increasing HDL cholesterol), and improve exercise capacity.

GH-releasing nutrients claim to release GH and thus have the positive effects associated with GH.

The number of nutrients found to possibly cause a release of GH are many, and include the amino acids arginine, leucine, ornithine, and glutamine; vitamins such as niacin, choline and pantothenic acid, and non-vitamin nutrients such as melatonin, as well as many others. Although there is a good deal of data showing many of these nutrients can cause a release of GH to some degree, not one study has demonstrated the same effects in humans or animals, as is seen with actual injections of GH as outlined above.

Other products claim to contain actual GH in extremely minute quantities, which is the nature of homeopathic products, which is they dilute a compound (in this case GH) down to virtually undetectable levels and claim it still has biological effects. Regarding GH, this idea is full of problems. For one, the amounts found in these products are of no biological significance, and even if directly injected at those levels, would have no effects on muscle mass or body fat levels. Another major issue is the fact that GH is a very delicate molecule and will not survive the digestive process as the 191 amino acid length of GH will be chopped up by digestive enzymes. There is no sold data showing any of these products effect muscle mass or body fat. So a thumbs down for homeopathic GH supps.

A secretagogue is a generally made up of short peptides, 6-11 amino acids long, that may survive the digestive process and are orally absorbable. This has been an intensive area of research for pharmaceutical companies looking for a better way to increase GH levels instead of injections.

"Although there is a good deal of data showing many of these nutrients can cause a release of GH to some degree, not one study has demonstrated the same effects in humans or animals, as is seen with actual injections of GH as outlined above."

Some studies have shown these pharmaceutical compounds can stimulate the production of significant amounts of GH. For example, one secretagogue made by the huge pharmaceutical company Merck, is called NK677. Research looking at NK677 found it increased the GH pulse during GH production and increased the frequency of the GH pulse.

Did this natural "pulse" of GH have an improved anabolic response over big single injections as studied in the previous research mentioned above? The answer appeared to be no, as there were no changes in muscle mass, strength or body fat in young weight lifters or older people who were given NK677.

To date, there is no data showing any of the "natural" secretagogues being sold on the supplement market alter body fat, muscle mass, or performance, much less the real pharmaceutical versions that are still being researched.

The problems with this category of supplements are many. For example, the age and GH status of the person appear to have a great deal to do with any released GH, and many factors will dictate how much if any, GH does get released.

I have not listed doses for the above nutrients because they vary so greatly, nutrient to nutrient. Some data also suggest that other counter regulatory hormones such as the catabolic (muscle wasting) hormone cortisol may go up in response to such products.

None of the GH releasing products listed above have ever been shown to keep GH levels sustained and/or reach high enough levers– as injections of real GH have achieved -– which appears necessary to see any real effects in body fat levels or muscle mass.

Also, in younger individuals with normal GH levels, even GH injections seem to be of little to no benefit. However, when combined with other hormones, such as anabolic steroids, many people feel regular GH injections (not supplements!) do have a synergism together that leads to greater increases in LBM and reductions in body fat than would be seen by either used alone. In the off season, some high level bodybuilders have used the stack known as "the big three" which refers to the use of testosterone, GH, and insulin combined. No doubt, this is a very potent combination of hormones. However, we have no real data to go on with this 'magic' combo in

healthy athletes..

The benefits of GH injections may be of real use to older populations that suffer from low GH levels, and many bodybuilders feel it assists in losing body fat and retaining LBM pre-contest. The truth is, GH levels go up and down all the time and can be altered by all sorts of things, from exercise, to standing in the cold, to hitting yourself on the head with a hammer…

Even if the current "GH releasing" products on the market do have some effects on GH (and I am not convinced they do), there is no reason to believe at this time they will effect muscle mass or body fat.

Sellers of such products make them look like the best thing since sliced bread by listing all the known effects of GH in the human body, then pretending their products have been proven to mimic those effects. The problem is they have not been shown to do this and probably never will. Even much of the research using injections of real GH is often conflicting.

For example, one study looked at both young and old people given fairly large doses of GH and put on a weight lifting program. Both groups were given 40 mcg per kg of GH daily, which is a good-sized dose.

This research found that GH didn't increase protein synthesis or decrease protein breakdown (anti catabolism) in the young guys lifting weights, even though their IGF-1 levels tripled. Also, there were no changes in strength between the GH group and the placebo group.

In the older group, the guys getting the GH did gain more fat free mass (FFM) than the placebo group. However, the additional FFM turned out to be almost all water and not actual protein accumulation in the group getting the GH. Both groups showed similar strength increases.

So, in total, the amount of actual muscle gained by the older group getting GH was "nada" and it didn't do anything for their strength either.

Their conclusion was that large doses of GH combined with weight training has no additive effects over that of just weight training and IGF-1 levels went up without anabolic effect.

They did however feel that small multiple doses of GH would work better than one large whopping dose as this study used.

What does the real world have to say?

There are a great many products on the market - most of these are a mixture of various nutrients known to cause transient spikes in GH levels. While a few experience very modest effects, it's safe to say that no one has ever lost a significant amount of fat, nor gained a significant amount of muscle by using them. This goes double for the various oral or "sublingual" GH preparations sold in health food stores or on the internet.

As alluded to above about supplements that claim to raise GH, it's one thing to raise the level of some hormone, but a totally different thing to show that a raise in that hormone is leading to more muscle mass or less body fat. That is, who cares if the product raises some hormone, if in the end, it has no effect on muscle mass or body fat?!

Recommendations:

This is not to say that GH does not play an important role in the body as a regulator of muscle growth and fat loss, but it is very clear that it is far more complicated than simply raising this hormone by injection or supplements. Another important thing to know: chronically high GH levels are not by default a good thing and can come with side effects over time, such as insulin resistance, various neuropathies, and other problems. Many bodybuilders I know personally have had to get their wrists operated on to relieve the pain of carpal tunnel syndrome they experienced from high dose injection of GH. It's not as uncommon as you may think in the higher ranks of bodybuilding, in fact, and is not something that gets coverage in the mags.

For older individuals who have confirmed low GH levels, GH therapy by injections given by a medical doctor might be worth pursuing. As for safety, the GH releasing supplements appear safe enough. At this time, I give GH supplements a thumbs down.

To discuss GH Supplements further, you can post in the Members' Area.

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Glycerol

Return to T.O.C.

What is it?

Glycerol (1,2,3-propanetriol) is an integral component of the triglyceride molecule. As most people who have taken a basic nutrition or biology course will tell you, glycerol forms the backbone of the triglyceride molecule, which is one of several ways the body transfers fat around in the body. If you break up a triglyceride, you will get three free fatty acids and glycerol (hence the reason it's called the backbone of a triglyceride).

Glycerol is defined as a naturally occurring trivalent alcohol. Similar to carbohydrates, glycerol oxidation yields 4.32 kcals per gram. So even though the number of calories in carbohydrates and glycerol are the same, structurally, they aren't the same.

What is it supposed to do?

Glycerol is a nutrient that has gotten some attention in the bodybuilding magazines as a supposed "plasma expander" and is hocked as having some ability to increase the fullness of muscles.

It's also added to MRP bars for its mild sweet taste and gives the bar good texture similar to fat. Glycerol is used in the food industry to improve moisture, palatability and as a sweetener.

What does the research have to say?

Over the past few years, there has been a great deal of confusion over exactly what glycerol is and what it is not. It's neither a carb, nor a fat, although it can be utilized for energy.

When the body is starved of both calories and carbohydrates, under the right conditions, it will convert certain non-carbohydrate substrates to glucose, such as glycerol, certain amino acids, etc. This is not major source of carbohydrates (glucose) under normal conditions. Under normal conditions, i.e. when a person is eating normally (not starving), you can consume enough glycerol to fill an elephant, but there are not large changes in blood glucose and insulin.

For instance, in a study published in the "European Journal of Applied Physiology," on six healthy, non-obese men – 32 years of age on average - during exercise to exhaustion on a cycle ergometer (73 percent of $V0_2$max). The men either ingested glucose, glycerol or placebo. The ingestion of glucose (1 gram per kg body weight, equal to 70 grams for a 150 lb. person) 45 minutes prior to exercise produced a 50 percent increase in plasma glucose, as well as a 3-fold increase in plasma insulin at zero minutes of exercise.

On the other hand, glycerol consumption (1 gram per kg body weight) 45 minutes prior to exercise produced a 340-fold increase in plasma glycerol; but resting levels of plasma glucose and insulin did not change.

Is there any use to glycerol in the diet? Possibly. Dr. Jose Antonio suggests that substituting glycerol for high-glycemic carbohydrates could minimize the plethora of health problems associated with eating cookies and cakes and other very high GI foods. As Dr. Antonio points out:

"...glycerol has little if any effect on resting plasma glucose and insulin at rest even after taking whopping doses."

Is glycerol a legitimate ergogenic aid? Since glycerol enables one to retain more fluid, some scientists theorize that taking exogenous glycerol might help performance. This is based on the fact that if one is well hydrated, one will be able to train harder and longer, particularly in hot environments.

Some studies have found mild improvements in endurance athletes given glycerol but studies have been mixed with some finding no effect. As with all science, there isn't a unanimous consensus on glycerol's effects. Some sports nutrition companies sell glycerol to bodybuilders as a "plasma expander" since glycerol can pull fluids into the vascular system temporarily and may enhance the pump you feel in the gym, or when stepping on stage.

What does the real world have to say?

So far, the feedback on such a strategy is mixed with many bodybuilders reporting a crushing headache after ingesting large amounts of glycerol. Glycerol monostearate - a monoglyceride which is the latest form of supplemental glycerol - may work better for this purpose. Several supplements on the market use glycerol monostearate. The feedback has been mixed with regard to the pump, but there appear to be few-

"...glycerol has little if any effect on resting plasma glucose and insulin at rest even after taking whopping doses."

er complaints of side effects.

Recommendations:

Glycerol does not appear to have any major effects on hydration or endurance. As far as strength training goes, it's only major use appears to be cosmetic: looking pumped may be good for one's ego, but it does little to add to real mass or strength. As an additive to low carb protein bars and other products, I give it a thumbs up, but as a workout supplement, I give it a thumbs down.

To discuss Glycerol further, you can post in the Members' Area.

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Medium Chain Triglycerides (MCTs)

Return to T.O.C.

What is it?

MCTs are technically saturated fats with 8 - 10 carbons, making them "medium" length fatty acids (the long chain fatty acids that make up food fats/oils typically have 16, 18, or more, carbons). MCT's can be produced by fractionating other oils, such as coconut oil.

What is it supposed to do?

MCTs are supposed to increase thermogenesis and help burn body fat. They are also promoted as a source of surplus calories for bulking that are less likely to be stored as body fat.

What does the research say?

What if there were a fat you could eat that was not stored as body fat and would just be burned off as heat? Would this be the nirvana of fat loss supplements and free energy source for athletes?

Well the proponents of Medium Chain Triglycerides (MCTs) would certainly like us to believe that MCT are the answer to athletes' and dieters' dreams. Is it true? Sort of.

Because of their shorter length, MCTs are processed differently in the body and can bypass many steps that long chain fatty acids must go through to be used as energy and stored as body fat. For example, long chain fatty acids must be transported to the mitochondria (the "power house" of cells) via something called the carnitine shuttle system.

This system is one of several limiting steps in the amount and rate of fat that can be "burned" or oxidized for energy at any one time. MCTs, on the other hand, can bypass this shuttle system and can enter the mitochondria directly to be used as energy. This is one of several reasons MCTs are considered less likely to be stored as body fat than long chain fatty acids.

Some studies in both people and animals suggests MCTs increase the thermic effect of food and increase daily energy expenditure (EE); which means

the energy is lost as heat rather than stored as body fat. However, the few studies that have looked directly at the use of MCT's for weight loss in humans have been disappointing.

More often than not, studies that looked at MCT's for weight loss in people have found minimal effects. The reason is not totally clear, but it may be because some of the positive effects of MCT's are offset by several negative effects on metabolism. For example, there may be an increased production of triglycerides and an increased release of the fat storage hormone insulin from ingesting MCT oils. There is some limited evidence that they may be of some value as replacements for LCTs in very low carbohydrate diets, but that's all.

Studies on the uses of MCTs to enhance athletic performance have been equally disappointing. MCTs don't spare the use of glycogen during endurance exercise, and don't improve performance. MCT consumption even impaired sprint performance in one study.

There are other possible drawbacks to MCTs. For example, MCTs don't contain fat soluble vitamins such as vitamin E, D, and K, nor do they contain any essential fatty acids (EFAs). MCTs do appear to have some genuine medical uses where digestion of fats and various liver problems exist, as well as having possible anti-catabolic (muscle sparing) effects in hospitalized patients.

What does the real world have to say?

Though MCTs may not be the nirvana of fat loss products and energy enhancers some people make it out to be, there may still be a place for this product in the athletes arsenal of supplements and some experimentation is recommended. Some athletes find MCTs to be useful within the context of a keto diet, or as a source of extra, easily metabolized calories.

Recommendations:

People who push MCTs as some sort of muscle building, anabolic fat are feeding people a load of you know what.

For building muscle and or improving strength and performance, MCTs get a thumbs down at this time.

To discuss Medium Chain Triglycerides (MCTs) further, you can post in the Members' Area.

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Myostatin Inhibitors

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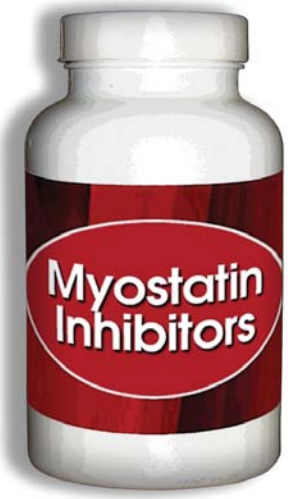

What is it?

The current supplements claiming to be "myostatin inhibitors" are based on a seaweed extract that (supposedly) was found to bind to myostatin in a test tube (in vitro). I don't think it takes a science degree to see that this idea is based on flimsy science at best, and wishful thinking and good marketing at worst.

What is it supposed to do?

Myostatin is a member of a superfamily of related compounds known as "transforming growth factors beta." They are intimately related to tissue growth and differentiation, as well as many other functions. What scientists discovered was by knocking out the gene that codes for myostatin (the famed "myostatin gene"), animals would grow up hugely muscular. One needs only to see pictures of that ridiculously muscular mouse in the supplement ads to know what I mean.

So the idea behind these supplements is that blocking myostatin will enable muscle growth.

What does the research say?

Scientists have been looking at these growth factors, what regulates them, what genes code for them, etc. since it may have applications to grow livestock with greater amounts of meat and less fat, or combating wasting syndromes in humans, such as AIDS, cancer, and muscular dystrophy. For example, high levels of myostatin have been associated with muscle wasting in HIV-infected men compared to healthy normal men. However, this simple association does not in anyway prove myostatin directly contributes to muscle wasting, per se. It may simply be an intermediate indicator vs. a direct cause.

Myostatin may be one way the body regulates lean tissue growth (muscle) and appears to be a direct inhibitor of skeletal muscle growth, at least in prenatal and perhaps growing animals, but its effects in adult animals– much less adult humans – is very poorly understood at this time. Further

research is needed to determine whether myostatin even plays a role in muscle growth after birth and in adults.

Relating to bodybuilders and other athletes, one theory is that the reason some people put on muscle so much easier than others is that they have a genetic propensity for making less myostatin due to a mutation in the gene. Conversely, the reason some people find it almost impossible to add muscle might be that they are genetically set up to have high levels of myostatin and, therefore, their efforts in the gym are being blocked. That overly simple theory is all well and fine, but data has been contradictory at best.

One group of researchers compared different groups of people to their level of muscularity and race and found that mutations in the human myostatin gene had little impact on responses in muscle mass to strength training. The fact is, muscle regeneration of injured skeletal muscle tissue, that is exactly how muscle heals itself in response to say weight training, is an extremely complex system that is not well understood.

To say that scientists, much less supplement companies, don't fully understand the roles of myostatin in exercise-induced muscle hypertrophy or regeneration following exercise, is putting it mildly.

Yes, myostatin probably plays an essential role as a regulator of LBM in adult humans as recent data would seem to suggest, but again, what role and how, is still be elucidated.

Ok, bottom line here is, scientists know very little about how or if myostatin plays a direct role in muscle tissue of adult healthy human athletes. It's also absolutely essential that people understand that all such systems in the human body are under the control of an immensely complicated system of checks and balances, multi-layered feedback pathways, some of which are known, many of which are not.

There is a reason the body regulates anabolic and catabolic processes so tightly, and altering that very delicate balance can have unforeseen long-term effects.

It's interesting to note that one pharmaceutical company has applied for a patent (United States Patent #6,369,201) that is an antibody to myostatin, and would reduce myostatin levels. There is no doubt that the research looking into the effects of myostatin on LBM of healthy and sick people is

an interesting and worthwhile pursuit by researchers, but as a supplement to spend money on, it is premature to say the least.

The current crop of supplements contain sulfated polysaccharides from brown seaweed (Cystoseira canariensis). Why brown seaweed? This is because polysaccharides isolated from brown seaweed were found to bind to serum myostatin in an in-vitro (test-tube) experiment. Needless to state, what happens in a test tube can be quite different from what happens when a compound is consumed and digested.

This was demonstrated rather conclusively by a 2004 study that fed 1200 mg/day of a commercial myostatin inhibitor to untrained males participating in a 12 week resistance training program. The study concluded:

"Twelve wk of heavy resistance training and 1200 mg/d of Cystoseira canariensis supplementation appears ineffective at inhibiting serum myostatin and increasing muscle strength and mass or decreasing fat mass."

"Twelve wk of heavy resistance training and 1200 mg/d of Cystoseira canariensis supplementation appears ineffective at inhibiting serum myostatin and increasing muscle strength and mass or decreasing fat mass."

What does the real world have to say?

Do you even need to ask? Commercial supplements based on Cystoseira canariensis (a.k.a. brown seaweed) are quietly fading into oblivion.

Recommendations:

There has been mention in the mags of an in vivo study with people, with results on LBM that seemed far too good to be true (what else is new!). Until such a study is published in a peer reviewed Western/legit journal (most scientists have little faith in Eastern Bloc research or journals as they often lack the same stringent quality control western research/journals are subjected to) by an independent source not associated with the company making these supplements, I see no reason for people to spend their hard earned money on such a product at this time.

Perhaps companies selling these supplements will fund some studies in adult humans showing they have some effects on muscle mass, strength, or performance, but until then, they get a big thumbs down from me at this time.

To discuss Myostatin Inhibitors further, you can post in the Members' Area.

Click Here

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Saw Palmetto

Return to T.O.C.

What is it?

Saw palmetto (SP) is from the dwarf palm tree family, the Serenoa repens species specifically. It's found growing in various areas of the United States, as well as other countries. Extracts of SP contain standardized levels of active compounds, which are fatty acids and sterols which are believed to have the desired effects.

What is it supposed to do?

SP has been used for centuries to improve sperm production, increase breast size, improve sexual vigor, as well as to improve the symptoms of benign prostatic hyperplasia (BPH). Saw Palmetto extract is often recommended as a cure all for everything from hair loss (MPB) to benign prostate enlargement (BPH) to gynecomastia. Saw Palmetto is commonly added to various supplement formulas or sold alone. It's particularly popular with companies selling "andro" products who claim the added Saw Palmetto (SP) will block any possible negative effects the androstenedione, androstenediol, etc., might cause. As andro supplements are now banned, at least in the US, it's a moot point these days.

For non-athletes, Saw Palmetto - often combined with other herbs - has been a standard alternative treatment for BPH, an affliction that many men suffer from as they age. Some people are also under the impression that Saw Palmetto works as an anti estrogen and will block the conversion of testosterone into estrogen avoiding gynecomastia, also known fondly in bodybuilding circles as "bitch tits."

What does the research have to say?

Perhaps Saw Palmetto's best known sales pitch to bodybuilders and other athletes is its supposed ability to prevent the conversion of testosterone to dihydrotestosterone (DHT). The story goes like this: The "male hormone" testosterone converts to the more powerful androgen (DHT) via the enzyme 5-alpha-reductase (5ar). DHT is known to be an important factor in the development of several problems many men face such as the aforementioned male pattern baldness and BPH. So, finding something that

blocks the 5ar enzyme should reduce the amount of DHT and said male problems should be improved or avoided (FYI, this is also how the drug Finasteride, name brand Proscar, works.). Of course it's a lot more complicated than that but (a) it's beyond the scope of this section, and (b) only science geeks like me need to know the information in the real world.

Anyway, Saw Palmetto has often been cited as an herb able to block the 5ar enzyme and is recommended to people losing their hair or suffering from BPH and/or is added to "andro" products to theoretically block any negative effects of such products. Sounds great, but is it true? A handful of in-vitro (test tube) studies have suggested that in certain cells, Saw Palmetto inhibits both types of the 5ar enzyme. This effect was noncompetitive and uncompetitive vs. Finasteride which works as a competitive inhibitor on the 5ar enzyme. However, in-vivo studies (i.e., studies using either animals or people actually ingesting SP) have generally failed to show Saw Palmetto reduced DHT system-wide as its major effect. Recent studies did not find SP altered testosterone either. It appears SP must be working by a different mechanism then as a simple 5ar inhibitor.

One of the best known effects of SP not related to blocking 5ar, was a study that showed SP actually blocked the uptake of both testosterone and DHT by approximately 40% in eleven different tissues that were tested. This information scared off a lot of people from using SP as the thought of having their testosterone blocked at the cell surface along with DHT did not seem like a good idea to most bodybuilders. The study did lead one to believe that part of the effect of SP is as an androgen receptor antagonist (i.e. it blocks the receptor that testosterone binds to at the surface of the cell) and this would not be what an athlete wants trying to gain muscle. Several studies appear to show SP acts at the level of the androgen receptor. So in theory, SP could actually hinder your hard work in the gym, but it's really theoretical at this time.

It's also possible that some of the effects of SP are unrelated to its effects on androgens (via blocking testosterone -> DHT and/or blocking androgen receptors). For example, research finds SP potentially blocks the inflammation. SP was found to block several key enzymes involved in the production of inflammatory promoters/regulators such as leukotriene (LT) B4 as well as others produced from arachidonic acid via these enzymes. What this tells us is that SP may act as a potent anti-inflammatory rather than as a blocker of testosterone to DHT. Interestingly enough, It's been shown that infiltration of the prostate by inflammatory cells is a key etiologic fac-

tor involved in the development of BPH. Translated, the immune system is involved in benign prostate enlargement. Actually the immune system also appears to be involved in MPB and that's an interesting angle being pursued by researchers in the field.

Finally, we come to the reputation of SP as some kind of anti-estrogen. This is perhaps the most interesting, yet potentially confusing, effect of SP. Several studies have suggested SP may exert some type of anti-estrogenic effect on prostate tissues. However, and this is a huge however, it does not tell the entire story.

Why? I'll get to it, but first we have to do a little side track. If you recall from the section on "Anti-Estrogens", I wrote that there are two ways to effect estrogen. You can a) block the receptor site; or b) you can inhibit the enzyme (known as an aromatase) that converts testosterone, androstenedione, etc., into estrogens.

To recap: when a molecule fits into the receptor but does not send an estrogenic signal it is called an "antagonist" meaning it prevents or "blocks" estrogen from getting to the receptor but does not in itself act as an estrogen. Hence the term "estrogen blocker." When something can lock into the receptor and does act as an estrogen, that is activates the receptor to one degree or another, it's called an "agonist."

So far so good right? What most people do not realize is that many things will have what is known as "mixed" antagonist and agonist properties. Before you slap your head in confusion, let me explain. Just because something has anti-estrogenic effects on one tissue does not mean it will have that effect on all tissues. In fact, and quite common, a compound can actually be an anti-estrogen in one tissue while actually acting as an estrogen (i.e., increasing estrogenic effects) in others! Many things are known to have mixed antagonist and agonist properties.

Remember when I said Tamoxifen was an estrogen receptor antagonist? Tamoxifen is a drug shown to have just such "mixed" properties, that is it has agonist or antagonist effects depending on the tissue in question. In women, Tamoxifen has been shown to act as an estrogen antagonist (i.e. blocks the estrogen receptor) in breast tissue but actually acts as an estrogen agonist in uterine tissues which is why it's used to treat breast cancer but may increase rates of uterine cancer. You all starting to catch my drift here?

"So where the hell is Brink going with this and what on God's earth does it mean to the hard training bodybuilder?!" you ask. Here is the rub: Just because SP might have some anti-estrogenic effects on the prostate does not mean it will prevent gyno, body fat increases, etc., known to occur from increased levels of estrogen (whether from andro products, steroid use, age, etc.) in all tissues. Companies or people that say otherwise are misleading you. There is no research to date that shows SP can prevent gyno or any other estrogen related problems bodybuilders are concerned about except possibly in prostate tissue.

"Just because SP might have some anti-estrogenic effects on the prostate does not mean it will prevent gyno, body fat increases, etc., known to occur from increased levels of estrogen... in all tissues. Companies or people that say otherwise are misleading you."

I realize it took me a while to get to that point but the reader can appreciate the fact that without the proper background you would be forced to just take my word for it. Now you know better.

You might recall that I mentioned another way of reducing estrogen, and that is by inhibiting the aromatase enzyme that converts testosterone into estrogens. A compound that can have that effect is an "anti-aromatase." Many people make the mistake of thinking Tamoxifen is an anti-aromatase when it is not. A true anti-aromatase is the drug Arimidex (anastrozole). There are also several plant isoflavones that appear to have anti-aromatase activity in-vitro (test tube) research but have yet to show this effect in animals or people, especially in the doses most people take them. All the research I have seen to date points to SP as working at the level of the receptor rather than inhibiting the aromatase enzyme, which is why I focused mostly on explaining the concept of receptor agonists, antagonists, and compounds with "mixed" effects. Capiche?

Finally, the research on SP's effects on BPH are much more convincing with several large recent trials finding it was equally effective as drugs prescribed for the same use. The vast majority of people reading this are interested in SP's claims of acting as an anti-estrogen or blocker of DHT production, vs. as a treatment for BPH, and that's why I focused on those effects over BPH. It should be noted however that the studies supporting the use of SP for BPH is much more compelling.

Whether Saw Palmetto inhibits 5ar, blocks the uptake of testosterone and DHT into the prostate, blocks estrogen at the receptor, or actually inhibits certain pro-inflammatory enzymes responsible for the etiology and formation of BPH, is not certain at this time. Perhaps it works by all those mechanisms.

What does the real world have to say?

Since SP has been around a long time, I have gotten a great deal of feedback from users. To date, no one has grown new hair, or prevented gyno, or anything else from the use of SP. Some have claimed it made their gyno worse. The only positive feedback I have gotten was from men who used it for BPH.

Recommendations:

There is no research that directly looked at SP for hair loss in men (i.e. MPB), nor is there any research that has directly shown Saw Palmetto can reduce the potential side effects of any of the andro products or steroids. So, companies selling SP and claiming it can cure any of these issues are working with more hype then reality. I have yet to meet one single person who has grown one single hair from using SP. Prevent gyno? Ditto for the gyno as far as real world feedback is concerned.

As mentioned above, where Saw Palmetto looks far more promising is in its effects on BPH. Studies using Saw Palmetto extract have shown positive effects on BPH symptoms. Though it is unclear exactly how Saw Palmetto improves the symptoms of BPH, there appears to be enough data and clinical evidence in favor of Saw Palmetto as a treatment for men who suffer from an enlargement of the prostate that is not cancerous. So, if you have BPH, SP does in fact look like worthwhile treatment and that has been confirmed by real world observations.

So, as a bodybuilding supplement in general, SP gets a thumbs down. As a possible treatment for BPH, it gets a "might be worth a try" rating. Men with BPH who wish to try SP, the standard dose is to use a standardized extract; two capsules daily of 160 mg (or one capsule of 320 mg) containing 85-95% sterols and lipids.

To discuss Saw Palmetto further, you can post in the Members' Area.

Click Here

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A Note On Prohormones & Designer Steroids

Return to T.O.C.

The reader will note one section is lacking in this e-book, which is a the coverage of either prohormones or the more recent "designer supplements." Prohormones such as M1T. 1-Test, 1-AD, etc. are a moot issue at this point due to the fact these products are basically unavailable and illegal. Thus, there is no reason to cover the pro hormones. People who simply have an intellectual curiosity about the prohormones, can read the excellent article "What Are Prohormones?" by Justin Alexander found on the Brinkzone.

Read "What Are Prohormones?" by Justin Alexander:

Click Here

All I will say is that making these products illegal only served to do exactly as I expected and predicted: create a market for other products some call "designer supplements" which should really be called "designer steroids." I am of course talking about products such as *Halodrol*, *Methyl-1-P*, *Methyl Masteron*, *PheraPlex*, *Trenadrol*, and *Superdrol*, which is probably the most popular of the group (as of this writing: Dec 2006) and the most available. Superdrol and the ilk have taken up where prohormones left off, bringing with them a new set of problems.

What are they you ask? Designer steroids (DS) exist in a very "gray area" of the law. The most effective ones, such as Superdrol, are simply true anabolic/androgenic steroids (AAS) that have been modified to be orally bioavailable. Superdrol, for example is allegedly Masteron, with a methyl group attached to the C - 17 (alpha) position (this "17-alpha-alkyl" modification is common to oral AAS, and is toxic to the liver, which is why supps like milk thistle, etc. are a part of the cycles for orals modified in this fashion). Other DS based on well-known AAS:

- *Trenadol*, is - as you might have guessed - is allegedly based on trenbolone.
- *Halodrol* - which has been withdrawn from the market - was based on Turinabol

Other examples exist, but the above gives a sample of this group of prod-

ucts. The reader will note I don't refer to them as "supplements" as they are nowhere near the definition of a supplement. Like the prohormones, some are either not available anymore or probably wont be in the very near future.

For legal reasons we are not going to provide specific dosage information and go in-depth about each type of DS in this e-book, but as they do enjoy some popularity amongst the more serious bodybuilders we have a specific section set up in the private Members' Area where questions can be asked.

To discuss "Gray Area" products further, you can post in the Members' Area.

Click Here

I know what you the reader is thinking, "but Will, anabolic steroids are illegal, how can they sell these products as supplements?" As I mentioned earlier, they fall into a grey area of the law. Relating to the legal aspect, I spoke to Rick Collins (www.steroidlaw.com) who is probably the foremost legal expert on steroids and the law. He told me:

"...loopholes and poor language in the current Anabolic Steroid Control Act may not allow the government to treat and prosecute these products as anabolic steroids (although they may violate other laws). As expected, banning the true prohormones marketed until January only led to more aggressive and potentially more dangerous gray market "supplements"

The bottom line here, is that I do not recommend the use of these "supplements. They are modified versions of existing compounds/hormonal analogs, and we don't know their pharmacology in terms of efficacy, side effects, etc. A certain amount can be figured out from the chemistry (e.g., it's potential to convert to estradiol, the steroid it's derived from etc.) but make no mistake, small changes in hormones and hormone analogs can have profound changes on their pharmacology that are not discovered from a simple look at their molecular structure. Make no doubt about this, these new compounds are NOT prohormones but true designer steroids of unknown pharmacology. For that reason alone, I recommend people avoid them. You are not using any sort of normal prohormone, but a true designer steroid with all the known-and more important-unknown effects good and bad. Side effects typical of some AAS have been reported, such

"...loopholes and poor language in the current Anabolic Steroid Control Act may not allow the government to treat and prosecute these products as anabolic steroids (although they may violate other laws). As expected, banning the true prohormones marketed until January only led to more aggressive and potentially more dangerous gray market "supplements."

as elevated liver enzymes, hair loss, and increases in blood pressure. Some seem to be more effective then others as far as AAS like effects in terms of increased strength and muscle mass.

You would in fact be better off using tried and true AAS that have well known safety records and pharmacology (i.e., Deca, Anavar, etc.), assuming you have decided to use steroids in the first place, which due to legal issues, I don't recommend. This not being a steroid e-book, I will end the discussion there.

Ok - so what can be concluded from all this?

- Although interest has died down somewhat (since they're no longer being openly advertised and promoted), people are still buying and using DS.

- While the FDA claims any AAS-based "supplements" are illegal, the agency has not taken any punitive action beyond sending warning letters to the major companies (as of this writing: Dec 2006).

Some supplement companies have either wisely withdrawn such products from their line up, and some companies continue to keep a low profile and sell these products on the "down low" so to speak.

In other words, I think DS will continue to exist in the gray area, as the legality of each individual supplement will have to be determined in each case before enforcement action can proceed. Testosterone has four rings: that's a hell of a lot of material for a chemist to play with.

I apologize to the reader for the ambiguous coverage of SD's, but that's because the situation is ambiguous. Interested readers should check the forums for the most up-to-date information on these products.

Making Sense of Supplements

Return to T.O.C.

Some readers may recognize this article of mine from times gone by. It was published originally in *MuscleMedia2000* many moons ago, and was later published as Chapter 11 of the Sports Supplement Review Third Addition put together by Bill Phillips.

Since both publications are no longer in print, I thought I would update it as its content is extremely useful for those looking to get closure on exactly what, when and how they should be taking the supplements I have reviewed in this e-book. The "Supplement Scoreboard" which follows this article summarizes which supplements might be worth taking, and how much to take.

Gain twenty pounds of muscle lose fifty pounds of fat!

"Gain twenty pounds of muscle," "lose fifty pounds of fat," and "increase strength by a million percent" are the exaggerated headlines of the ads you find in most magazines.

Certain supplements will help you gain muscle, lose fat, and increase strength, but as most people have found out the hard way, the majority of supplements will do none of the above.

When it comes to training and diet, the average bodybuilder has something of a semi-blueprint or plan as to how he or she will workout and eat. When it comes to supplements, however, there is more of a hit-or-miss mentality with unrelated products being mixed together in the hope that something - anything - will happen to improve one's lean mass, body fat levels or health.

This tends to be a rather expensive and confusing process which generally leaves the person frustrated, poor, and just plain sour on the prospect of trying anything new for supplements. For example, you have Bob who is taking ribose, vitamin E, and L-carnitine. Then there is his partner Joe who is taking L-arginine, CEE, and MCT oil. Bob's girlfriend uses soy protein, HMB, and chromium picolinate. Lets not forget Joe's girlfriend's friend Lisa who takes ginseng, CLA, and wild yam extract! Does this scenario seem oddly familiar to you?

"When it comes to supplements, however, there is more of a hit-or-miss mentality with unrelated products being mixed together in the hope that something - anything - will happen to improve one's lean mass, body fat levels or health."

People will often ask about a certain supplement and look dissatisfied when they don't get the particular answer they want. There are those supplements that are good for a specific application but bad for another. There are supplements that are good to take at specific times, but bad to take at other times. There are supplements that should be taken year round, and of course there are supplements that just plain suck all the time!

Mega Grow Testosterone Builder 9000!!!

A person will ask me "what do you think of this supplement called "*Mega Grow Testosterone Builder 9000*" and I often can't give them a straight "it's good" or "it bites the big one" type of answer.

The bottom line is that there are few black and white areas in the field nutrient supplementation, but there is a whole lot of gray! I tend to see supplements as a pyramid, not unlike the food pyramid discussed at the beginning of this book. In my opinion, there are the supplements you should take all the time and are a staple part of the diet (the bottom of the pyramid).

Next, there are the supplements you can take regularly to improve performance, health, and/or convenience (the middle of the pyramid) but you can cycle these products or change them. Even though they are not necessarily essential to your health, they are clearly worth using on a regular basis.

Finally, there are several categories that have to be added.. One is the huge category of crap supplements not ever worth bothering with regardless of the application. Then there are supplements that are useful only at specific times or for defined periods of time. Next, there are supplements that could be considered strictly optional, but have some use in a well-rounded program. Finally, there are the supplements you can give an honest try and see if they work for you, but should not be relied on as staple or foundation-type supplements. Each of these would form a sub-category within the pyramid at the top.

Foundational supplements (the bottom of the pyramid)

A foundational supplement is something you take year-round and is usually an essential nutrient, such as a vitamin, mineral, fatty acid, etc. Essential nutrients are just that - essential to life itself.

The basic definition of an essential nutrient is anything the body cannot manufacture itself and must be obtained from the diet or the person will get sick and/or perish if the nutritional deficiency is not corrected.

We know that there are approximately 8 amino acids, a multitude of vitamins and minerals, and two essential fatty acids that must be obtained from our diet on a regular basis and in adequate amounts or we do not and will not function at our optimal capacity.

When I am asked by some aspiring bodybuilder what my opinion is of some new supplement, the conversation usually goes something like: "Will, what do you think of this new product called *Bull Gonad-Testomaxi-Bulk Up*. Should I take it?" My answer is always something like "is your nutrition solid?" or "do you take a good multi-vitamin and multi-mineral? Are you taking flax oil or other oil blends (e.g., *Udo's Choice*) and a good protein powder? Do you have the basics down?"

They give me a look of confusion and say "well no I am not, but what does that have to do with the product I asked you about?" This is the equivalent of asking me if I like leg extensions out of the blue. I would ask "do you squat?"

The point being, what reason is there to do leg extensions if a person does not do a foundational exercise such as the squat? There is no reason, unless your goal is legs of string! Are you starting to see what I am getting at here? What reason is there to even bother with a fancy new supplement if your essential nutrient needs are not being met?

Every single cell in your body relies on some vitamin, mineral, or other essential molecule to function at peak levels. A deficiency in a single essential nutrient that goes uncorrected will shut down the anabolic drive faster than a centerfold of Monica Brant gives the average guy a...well you get the point! Why spend your hard earned $$$$$ on a new supplement that promises "30 pounds in 30 days" if your body is shunting what little essential nutrients it gets away from building muscle to keeping you alive and well?

Obviously, a full description of every vitamin and mineral and all their functions would take several large text books to explain, so I won't even attempt it here, OK?

This is the point where we could (should?) get into that ongoing argument by mainstream nutritionists and doctors who say "you get all the vitamins you need from your food" or "supplements just give you expensive urine."

Expensive urine?

Again, it depends on the nutrient in question, but bottom line; the chances of a strength-training athlete getting optimal (as opposed to adequate) amounts of vitamins, minerals, and essential fatty acids from our nutrient deficient-processed food supply is zero, zip, nada, ain't gonna happen! Expensive urine? The last time I checked, chemotherapy, cholesterol medications, heart bypass operations, and countless other avoidable medical treatments are considerably more expensive than the average multi-vitamin and mineral supplement. Don't get me started!

I realize it has taken an amazingly long time to just get to the point of this section, which is that you should always be taking a good multivitamin everyday of your life (see BBR forum for recommended brands of multivites).

Although this seems like common sense, you would be amazed at how many bodybuilders don't take them, assuming they get all they need from those nine chicken breasts and three boxes of white rice they eat every day...

Another product that should be considered as a foundational, year-round nutrients is a source of unprocessed and unaltered essential fatty acids. As with most vitamins and minerals, it is virtually impossible to get optimal amounts of unprocessed essential fatty acids (especially the omega-3 fatty acids) from our heavily processed food supply. The two essential fatty acids we need are Linoleic acid (LA) which is an omega-6 fatty acid and Alpha-Linolenic acid (ALA) which is an omega-3 fatty acid (see Chapter 1 for more information).

Unless you have been living in a cave for the past few years, you know the nutritional authorities "in the know" have been singing the praises of these amazing fatty acids for some time now.

"...you should always be taking a good multivitamin every day of your life...Although this seems like common sense, you would be amazed at how many bodybuilders don't take them, assuming they get all they need from those nine chicken breasts and three boxes of white rice they eat every day..."

Performance enhancing/health/convenience supplements (2nd row of the pyramid)

- *Whey Protein*: The astute person will have noticed that although certain amino acids are considered essential nutrients, I did not mention them under foundational supplements.

  Unlike vitamins, minerals, and essential fatty acids, adequate amounts of essential and non-essential amino acids can be gotten from our food. However, getting all the amino acids we need from our food is not always convenient and it is arguable whether or not we can get optimal amounts for muscle growth from our foods; as opposed to adequate amounts.

  Also, several protein foods have specific amino acids or properties that we want. For example, whey protein has the highest biological value (BV), is almost 50% essential amino acids, and is moderately high in glutamine (though some companies add more glutamine).

  Besides being a great protein for bodybuilders, whey protein improves immunity and raises glutathione, to mention only a few potential health benefits. Thus, a good protein supplement or high quality meal replacement product is an important part of any well-planned supplement program, although you don't need it per se and could probably live without such products if you had to.

- *Antioxidants*: Without going into a long (and mega-boring) biochemical explanation, antioxidants are a special class of vitamins and other non-vitamin compounds that neutralize free radicals. Free radical pathology has been implicated in a broad range of diseases such as cancer, atherosclerosis, immune deficiency, diabetes, to name only a few afflictions we would all like to avoid. More important to bodybuilders, free radicals cause inflammation, damage to muscle fibers, fatigue, and possibly immune suppression. Intense exercise causes a dramatic rise in free radicals with a simultaneous reduction in antioxidant systems within the body to fight them.

  If left unchecked, free radicals will lead to the breakdown of muscle tissue and various other problems, and we sure as hell don't want that! Antioxidants are just not all that sexy and don't get much attention these days in the bodybuilding magazines, but I can assure you they

are very important nutrients for long term health and continued progress in making gains in muscle. No one ever exploded with new muscle from the simple addition of antioxidants to their diet, but they may help build muscle in the long run and improve immunity to a variety of challenges (i.e. you can't lift weights if you're sick in bed!).

For you drug-using athletes - and you know who you are - anti oxidants have also been found to be somewhat liver protective from the use of oral steroids.

Antioxidants such as vitamin E and C,, and many others can be found in a good antioxidant formula and should be used year round by all hard training bodybuilders and other athletes of both the natural and non-natural variety.

- *Creatine monohydrate:* Though it may be the best thing since the discovery of sliced bread, creatine is not an essential nutrient. Certain foods (i.e., red meat) are moderately high in creatine and the body can synthesis creatine from the amino acids arginine, glycine, and methionine. Regardless of this fact, the intake of creatine in far higher amounts than could ever be found in food or synthesized in the body has been verified by the research and proven in the "real world" to put muscle on people and increase strength. It's cheap, it works, and it's safe, so this is definitely a year-round staple supplement.

  Creatine has also been found to have an amazing array of potential health benefits and may help with a vast number of diseases. For more information on that, download my recent report on the topic from the Members' Area or at www.creatine-report.com.

  Download The Creatine Report:

  Click Here

"Optional but useful" supplements, supplements to experiment with, specific application supplements, and ineffective/useless supps.

Now we must divide the tip of our pyramid into four subsections:

- *Optional, but useful supplements:* These supplements are not as important as the ones in the previous two categories, but are nice additions

to round out your supplement program.

- *Supplements to experiment with:* This category comes under those supplements that "might be worth a try" but: (a) have some research behind them but more needs to be done, (b) seem to work for some people but not for others (c) are expensive (d) the "experts" can't seem to agree on it, that is, some experts like the product(s) and some don't, or; (e) all of the above! These are all listed in the "Supplement Scoreboard" in the next section.

  Clearly, I have my own feelings on which one of them is good and bad (which I give in each review), but they all have at least some research behind them, appear to work for some people, and there are plenty of "experts" who would not agree with me if I were to tell you what I think of all of them.

  The main point of this section is this: Although they might be worth a try, I would never recommend giving up or stopping the use of any of the supplements in the first two levels of the pyramid to use them.

  The first two levels of the pyramid consist of supplements that should be taken year-round and are not cycled or exchanged for another type of product that has no relationship to it. For example, you would never stop taking antioxidants to start taking glutamine or phosphatidylserine, or stop taking whey protein to start taking ZMA.

- *Specific application supplements:* The supplements in this category cannot be classified as either "good" or "bad," but they are useful at specific times and for specific purposes. Ephedrine comes to mind as the perfect example of a product in this category. Ephedrine is not something that should be taken year round in my view. Taken occasionally before a workout to give a person a boost, the stuff works great. If taken for a defined period of time for a specific purpose, combined with caffeine (see FLR e-book for recommended amounts of each), it is a fantastic and relatively safe way to reduce body fat. Say you want to get lean for the summer. You clean up your diet a little, add in some aerobics, and take ephedrine, caffeine mixture for ten to twelve weeks.

  Voila! You're ripped and ready for summer. However, taking ephedrine year round is hard on the system, can have potential side effects, and will ultimately be counterproductive to adding muscle in the long run if

not cycled on and off or used occasionally as energy booster for tough workouts. The problem is, I see people popping handfuls of the stuff every time they train all year round. That's a mistake.

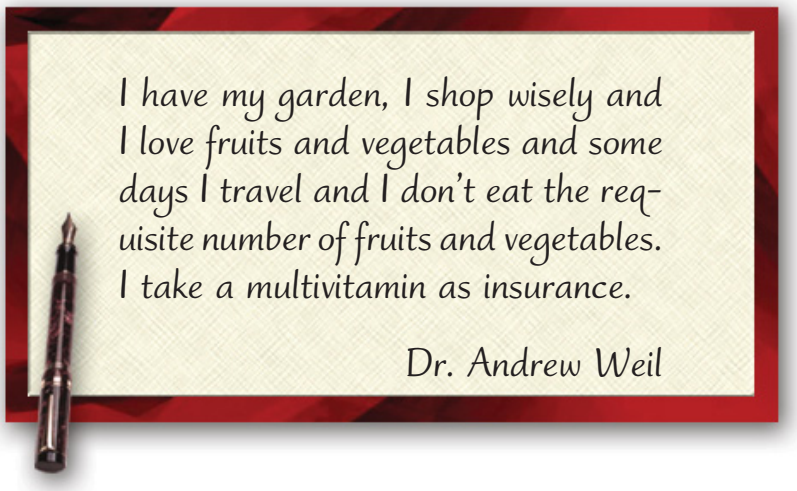
- *Ineffective supplements:* From bug molting hormones (beta-ecdysterone) to bee spit (bee pollen/royal jelly), this is a long, long, long, list! Hmmm, where do we start? Vanadyl sulphate? Plant sterols? Myostatin inhibitors? What can I say, there are a lot of worthless supplements out there in the world. See the "Supplement Scoreboard" for a (partial) list.

Conclusion

I hope this helps clear up some of the confusion faced by people who don't know what to take all the time, what to take most of the time, and what is worth an honest try, as well as what is clearly not worth wasting $$$ on. The reader will note I didn't cover fat loss supps in depth, as this article focuses on the issues of the BBR. Fat loss supps are covered and ranked in the Fat Loss Revealed e-book and Members' Area forum.

For information on the "Fat Loss Revealed" e-book:

Click Here



Supplement Scoreboard

Return to T.O.C.

This section is designed to summarize the supplement recommendations in the reviews, and to rank them according to the framework in the "Making Sense of Supplements" article. Use this guide to help choose they types and doses of supplements that you use, and make the best use of the $$$ in your supplement budget.

The focus of this section is on supplement ingredients. If you need help evaluating a specific, brand-name supplement, or are interested in getting some recommendations, please visit the Members' Area forum. If you don't find what you're looking for, feel free to post a request.

Visit the "Specific Supplements by Brand Name" area of the forum:

Click Here

Foundational Supplements

These are the elements from this chapter that are part of the backbone of any solid supplementation program. If these bases aren't covered, additional supplements are likely to be a waste of time and money.

Multivitamin/Mineral Complex

Recommended Dose: at a minimum, a multivitamin should supply 100% of the RDA/DRI of the 13 major vitamins listed on page 240. A good multi will also typically contain useful doses (25% - 100%) of the major and trace minerals.

Essential Fatty Acids

Recommended Dose:
Flax Oil - 1 tablespoon per 75 lb. body weight
Udo's Choice - 1 tablespoon per 50 lb. body weight
Fish Oil - the equivalent amount needed for 2 g EPA + DHA

Performance Enhancing/Basic Health/Convenience Supplements

These are basic supplements that will give you the most value for your money, and help enhance the results of your workout/nutrition programs.

Whey Protein
Recommended Dose: 0.5 g/kg for pre-/post-workout; also as needed to increase protein intake

Antioxidants
Recommended Dose:
Vitamin C: 200 - 500 mg/day; Vitamin E: 400 IU/day

Creatine Monohydrate
Recommended Dose:
Loading (if desired): 5 g x 4 times per day for 5 days; otherwise, 3 - 5 g/day for 1 month, followed by 2 - 3 g/day for maintenance.

Supplements That Are Optional, But Can Be Useful For A Muscle-building Program

These supplements are not essentials, but can provide some additional benefits.

Beta-Alanine
Recommended Dose: 3 - 6 g/day in divided doses

Glutamine
Recommended Dose: 5 - 20 g, usually taken post-workout

Taurine
Recommended Dose: therapeutic doses range from ~1.5 g - 6 g/day

Tyrosine
Recommended Dose: 0.5 - 2 g, taken on an empty stomach

Phosphatidylserine
Recommended Dose: 400 - 800 mg/day

Casein
Recommended Dose: use as needed/desired for additional protein (not recommended for pre-/post-workout)

Other Proteins
Note: for most people, some supplemental whey and casein should be sufficient. However, you may want to use other sources in the event of allergy,/intolerance, or simply for the sake of variety.

- **Egg White Protein**
  Recommended Dose: use as needed/desired for additional protein (not recommended for pre-/post-workout)
- **Serum Protein Isolate**
  Recommended Dose: use as needed/desired for additional protein (not recommended for pre-/post-workout)
- **Vegetarian Proteins (Soy, Hemp, Rice)**
  Recommended Dose: use as needed/desired for additional protein (not recommended for pre-/post-workout)

Supplements To Experiment With

The evidence for these supplements is mixed and inconclusive, but some people have found them useful.

Citrulline
Recommended Dose: a minimum of 6 g/day - can be in divided doses (i.e., 3 g x 2x/day)

Colostrum
Recommended Dose: 20 g/day

ZMA
Recommended Dose: 30 mg zinc (as monomethionine/aspartate); 450 mg magnesium (as aspartate); 10.5 mg vitamin B_6 - taken before bed on an empty stomach

6-OXO
Recommended Dose: 300 - 600 mg/day
Note: 6-OXO is not recommended for women

Bacopa monnieri
Recommended Dose: 200 - 400 mg of an extract standardized to 20% bacosides

Ashwagandha
Recommended Dose: 3 - 6 g/day of the dried root, or 300 - 500 mg of a standardized extract

Ginseng
Recommended Dose: 50-100mg per day of an extract containing at least 7% - 10% ginsenosides, 2-3 times per day.

Rhodiola rosea
Recommended Dose: 100 - 200 mg of an extract standardized to 3% rosavins.

Supplements Useful For Specific Applications

The supplements in this group are most useful for specific situations, such as cutting or pre-workout.

BCAAs
Recommended Dose: 5 - 10 g/day in divided doses

Caffeine
Recommended Dose: 100 - 200 mg pre-workout (do not take within 4 h of bedtime)

CLA
Recommended Dose: 3 - 6 g/day in divided doses

Supplements That Are Unproven Or Ineffective For Improving Performance Or Gaining LBM

The supplements in red are those that may have some use for people with specific conditions, in spite of the fact that they aren't useful for adding muscle or improving performance. Readers should consult the individual supplement reviews for further information.

Arginine/AAKG	Fenugreek (Testofen)
Ornithine/OKG	Horny Goat Weed
Arachidonic Acid	Maca
DHEA	Tongkat Ali
7-Keto-DHEA	Tribulus terrestris
HMB/KIC	Ecdysterones
Carnitine	Methoxyisoflavone
Ribose	Beta-Sitosterol
Calcium*	GH Supplements
Chromium Picolinate*	Glycerol
Vanadyl Sulphate*	MCTs
Chrysin	Myostatin Inhibitors
I3C/DIM	Saw Palmetto
Avena sativa	

* in addition to what is obtained through diet or general multivitamin/mineral supplement

How To Use The Supplement Scoreboard

Return to T.O.C.

To illustrate how the Scoreboard can be used to evaluate a supplement, we'll apply the information to a commercial product that I'll call *"Mega-Test Xtreme"* for the purposes of this discussion. *Mega-Test Xtreme* is based on an actual supplement.

Let's take a look at the ingredients and dosage instructions:

Serving Size: 2 Capsules
Servings Per Container: 30

Amount Per Serving:

Ingredients:
Zinc (Chelate): 30 mg 200%
Vitamin B_6: 5 mg 200%
Magnesium (Aspartate): 100 mg 20%
Tribulus Terrestris Extract: 40% 900 mg
Dehydroepiandrosterone (DHEA): 50 mg
Test Support Blend: 550 mg
- Avena sativa Extract
- Peruvian Maca Root
- Eurycoma longifolia Jack Extract
- Saw Palmetto Berry Extract
- Chrysin

The first 3 ingredients are: zinc, vitamin B_6, and magnesium. Recognize it? It's the same combination of nutrients that you get in ZMA, which is in the "worth a try" table. If you look a little closer though, you'll see that the amounts are different. According to the table, a serving of ZMA provides:

- 30 mg zinc (as monomethionine/aspartate). This supplement provides the standard amount of zinc, although it doesn't specify what it's chelated to. Still, we can let that slide, since there's no real proof that the form used in ZMA is more bioavailable than other forms.

- 450 mg magnesium (as aspartate). There's a big difference here: *Mega-Test Xtreme* provides only 100 mg of magnesium (aspartate).

- 10.5 mg vitamin B_6. Another difference - our example supplement contains 5 mg of vitamin B_6 , which is less than half the amount in ZMA.

So these ingredients have the "feel" of ZMA, but don't quite match up to the real thing. Do the differences matter? It's hard to say, but since magnesium is something that athletes are short on, and I'd want to make sure I was getting an adequate amount in my supplement, I would be concerned about this.

The next ingredient is "Tribulus Terrestris Extract: 40%". Presumably, this means that the extract has been standardized to 40% of a particular compound, but what it might be isn't stated. This isn't likely to matter though, since there's no evidence that Tribulus even works - which is why it's on the "ineffective" list.

Then there's "Dehydroepiandrosterone (DHEA): 50 mg". DHEA is also on the "ineffective" list, but is listed in red, which means there are other possible uses. If you're middle-aged or older, there's a good chance that your DHEA levels might be low. So DHEA is a supplement that might be worthwhile to take, albeit for other reasons than adding mass/strength.

Finally, we have a proprietary blend that contains several different herbal extracts:

- Avena sativa: this is on the "ineffective" list, and for good reason. There is exactly zero good evidence that it has any effects at all on testosterone.

- Peruvian Maca root: this is also on the "ineffective" list. The one small positive study discussed in the review noted that 1.5 - 3.0 grams were used. There are only 550 mg in this entire herbal blend. So even if maca were effective, the dose here is too small.

- Eurycoma longifolia Jack Extract: also "ineffective" for raising testosterone and/or enhancing lean mass/strength.

- Saw Palmetto Berry Extract: SP has some use for BPH, but in larger doses than this 550 mg blend could possibly provide. It's also on the "inef-

fective" list.

- Chrysin: also "ineffective," since it's not well-absorbed.

Mega-Test Xtreme provides a few compounds that might be useful for health reasons, but most of the ingredients will do nothing to boost testosterone, or increase muscle mass.

Verdict? Save your $$$!

Other supplements can be a bit tougher to evaluate. Take a rival product, *"Ultra T-Boost,"* for example:

Serving Size: 1 Tablet
Servings Per Container: 30

Amount Per Serving:

Niacin 30 mg 150%
Zinc (as zinc oxide) 30 mg 200%
Copper (as copper oxide) 4mg 200%

Premium Blend: 541 mg
Korean Ginseng root 10:1 extract
Ginkgo Biloba leaf standardized extract
Tribulus Terrestris extract (45% saponins)(aerial)
L-Arginine HCl
Avena Sativa extract (aerial parts)
horny goat weed standardized extract (whole plant)
maca root
muira puama extract (aerial part)
octacosanol
saw palmetto berry
swedish flower pollen extract

Once again, there are ingredients that are on the "Ineffective and Unproven" list: Tribulus terrestris, Avena sativa, arginine, horny goat weed, maca, and saw palmetto. Niacin, zinc, and copper are essential nutrients, but - as noted in the previous example - you should already have these covered.

Ginseng is on the "Supplements to Experiment With" list. So far, so good.

But there are some other ingredients that aren't anywhere to be found in the Scoreboard: Gingko biloba, Muira puama, octocosanol, and Swedish flower pollen extract. What to do?

First, a reality check: it would be virtually impossible for me to cover every single ingredient ever included in the thousands of supplements marketed to bodybuilders. For one thing, many have nothing to do with adding-muscle, but are fat burners, mood enhancers, etc. Others are not widely used. It would be a waste of space to cover things like Urtica dioca, Sarapa-rilla, Kudzu extract, Ajuga turkestanica, "moomiyo", etc. This chapter is sup-posed to be an overview, not an encyclopedia!

Nonetheless, there is a way to deal with this particular issue:

Use the forum! The Members' Area forum was created to provide addition-al information that the e-book can't. If you're not sure about a particular product, then consult the forum. There are over 440 brand-name supple-ments reviewed there already, so do a search. And if the supplement you're looking at isn't there, then all you need to do is ask.

To request a review of a brand name supplement:

Click Here

To review a particular supplement ingredient:

Click Here

To ask a general supplement question:

Click Here

"The Members' Area forum was created to provide additional infor-mation that the e-book can't. If you're not sure about a particular product, consult the forum. There are over 440 brand-name sup-plements reviewed there already, so do a search. And if the supplement you're looking at isn't there, then all you need to do is ask."

Chapter 6: Training

Introduction To Training

Return to T.O.C.

This section is designed to cover the basic three and four day splits that the majority of people use. More complex topics, such as intensity and volume cycles, time under tension, and the many other variables that need to be addressed for long term increases in strength and LBM are addressed in the "Individualization of Mass Gaining Training Programs by Charles Poliquin.

In addition, routines and advanced training concepts are covered in depth in the Members' Area forum. Entire sections of the forum cover well-known trainers (e.g., Charles Staley, Brian Haycock, Louie Simmons, Poliquin, etc.) systems and theories for increasing your knowledge of the topic.

To discuss other training methods further, you can post in the Members' Area.

Click Here

The following pages contain sample routines using basic exercises to get started on the right foot. These can, of course, be altered after reading the more in-depth information in Charles's section and the forum, as well as the training materials offered by the trainers above.

With that in mind, any good strength coach will tell you the best way to get results is to employ different methods of training to continuously force the body to compensate for the new stimulus and prevent adaptation. Changes in volume, rep tempo, time under tension, exercise choice, loading parameters, and many other variables can be and should be manipulated to get optimal results in strength and muscle mass.

Although the science of resistance training has come along way in the past few years, its not, nor should it be as complicated as the theory of relativity and is ultimately nothing more than putting together your knowledge of basic human physiology, weight training theory, and realistic goals. The most important concept to know about weight training, as it relates to physiology and theory, is this: weight training is a qualitative, not a quantitative, effort. It is not the amount of time spent doing it, but the intensity put into it, that will yield the results you want. Translated, weight training should not be seen as an endurance exercise!

In the past, one theory on the best way to increase strength and or LBM was often pitted against another "gurus" advice, and the two were often polar opposites, with one coach recommending high volumes while the other recommending very low volumes and frequencies (think Menzter here).

"In the past, one theory on the best way to increase strength and or LBM was often pitted against another "gurus" advice, and the two were often polar opposites, with one coach recommending high volumes while the other recommending very low volumes and frequencies (think Menzter here)."

However, they were just that: theories, as hard useful data was lacking. That has changed dramatically over the past few years with big advancements in relevant and useful research we can apply to "real world" weight training.

I'm not going to fill up space here by doing an exhaustive review of the research on resistance training, but will outline what has generally been concluded via a recent meta-analysis on the issue.

It should be noted however, there is no perfect routine or training schedule that will work for all people all of the time. Changes in volume, intensity, rep ranges, rep tempo, and other variables are the key to long term success in weight training. Anyone who claims to have the one and only program that will work for everyone all the time forever is, to put it delicately, full of crap!

Ok, so what does the bulk of the data have to say based on the aggregate of the studies via a meta-analysis on what is the most effective way to make progress in weight training?

An excellent review on the issue called "A meta-analysis to determine the dose response for strength development" and was done by a Dr. Rhea and co-workers at the Department of Exercise and Wellness at Arizona State University. They looked at 140 studies that met their criteria for being included in the meta-analysis.

Studies showed different responses based on the training status of the participants, that is whether or not they were new to weight training or experienced lifters.

Training with a mean intensity of 60% of one repetition maximum (1RM) elicits the best gains in untrained individuals.

Training with 80% of 1RM is most effective in those who are already trained (i.e. are not new to weight training). Untrained participants experience optimal gains by training each muscle group 3 days per week.

Trained individuals get their best responses training each muscle group 2 days per week.

Four sets per muscle group elicited the maximal gains in both trained and untrained individuals.

The authors of this meta-analysis concluded:

"The dose-response trends identified in this analysis support the theory of progression in resistance program design and can be useful in the development of training programs designed to optimize the effort to benefit ratio."

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In addition, there has been a steady increase in the number of studies that also put that entire single set versus multiple set controversy to rest. The reality is data-as well as real world results-is quite clear; multiple sets are superior to single set regimens, and that has been shown in both studies that looked at strength or studies that looked at effects on anabolic hormones (i.e., testosterone, growth hormone, IGF-1) that are essential for increasing strength and muscle mass (Gotshalk LA; et al. Can J Appl Physiol, 22(3):244-55 1997).

Thus, people following various "high intensity" routines that call for single sets would be best to rethink their training, but again, even those routines may have a place as part of an overall program that cycles volume, intensity, etc. Of course, there will be a diminishing return with too many sets where over training or injury will follow. As with all things in life, more is not always better.

Again, the above findings are not written in stone in that people will get their best results by manipulating variables such volume, intensity, rep ranges, and so on, but the above does give some good insight for coming up with a basic plan of attack for setting up an effective program and greatly reducing the amount of confusion out there that is so prevalent. I will be using the results from this excellent review as a general guide for the routines to follow, in particular, the four day split.

True Beginners

Return to T.O.C.

True beginners, that is people that have never really worked out with weights, should really start with whole body conditioning type workouts, done two to three times per week.

Jumping right into advanced routines is one of the biggest mistakes I see people make. General rule of thumb is to train larger body parts that demand the greatest effort followed by smaller body parts in a general descending order.

My favorite line-up goes in this order: thighs, hamstrings, back, chest, shoulders, biceps, triceps, and calves. You can construct your own line up, but remember to use the larger to smaller muscle group rule when doing so. You should keep up a good pace, and shouldn't have any trouble completing it in under an hour. Using the body part line up outlined above, this is what a typical workout might look like:

Whole Body Workout (2 - 3 times/week)			
#	**Exercise**	**Sets**	**Reps**
1	Barbell Squats	3 - 5	6 - 10
2	Semi-Stiff Legged Deadlifts	2 - 3	6 - 10
3	Standing Calf Raises	2 - 3	10 - 20
4	Wide Grip Chin-ups*	2 - 3	6 - 10
5	Flat Bench Press	2 - 3	6 - 10
6	Seated Dumbbell Presses	2 - 3	6 - 10
7	Straight Bar Curl	2 - 3	6 - 10
8	Close Grip Bench Press	2 - 3	6 - 10
9	Crunches	2 - 3	15 - 20

*Some people may need to work up to doing chin-ups. Assisted chin-ups can be performed using a spotter: if you bend your knees, the spotter can assist the lift by supporting the ankles. You should do the negative (downwards) portion of the exercise on your own, and control the descent as much as possible. Start with one set, and work up to 2 - 3.

Other total body workouts can be constructed using different exercises or body part line up. For example, some people might prefer to start with upper body (i.e. back, chest, etc.) and do legs afterward.

To discuss Whole Body Workouts further, you can post in the Members' Area.

Click Here

To download a pre-printed workout chart:

Click Here

The Classic 3-Day Split

Return to T.O.C.

The classic three day split has the body split into three parts which means each body part gets hit directly once every seven days. Typical splits might be:

Monday: Chest and back
Wednesday: Thighs and hamstrings
Friday: Shoulders, arms, and calves

OR:

Monday: Chest, biceps, and triceps, and calves
Wednesday: Thighs and hamstrings
Friday: Back and shoulders

There is a basically endless combination of workouts that can be done, but the above are two fairly common three day splits. For additional routines using the three way split, refer to the forum.

As the three day split allows for seven days between workouts for each muscle group to be trained directly, this routine tends to have a higher per body part volume per workout due to the longer recoup time of 7 days versus training a body part directly 2-3 times per week. A typical three day split routine using workout number one above might look like:

3-Day Split: Monday			
#	**Exercise**	**Sets**	**Reps**
1	Barbell Bent Rows	3 - 4	6 - 10
2	(Weighted) Chin-ups	3 - 4	6 - 10
3	Partial Rep Deadlifts	3 - 4	6 - 10
4	Flat Bench Press (barbell)	3 - 4	6 - 10
5	Incline Dumbbell Press	3 - 4	6 - 10
6	(Weighted) Dips	3 - 4	6 - 10

3-Day Split: Wednesday			
#	Exercise	Sets	Reps
1	Barbell Squats	5 - 6	6 - 10
2	Leg Extensions	3 - 4	6 - 10
3	Semi-Stiff Legged Deadlifts	4 - 5	10 - 20
4	Lying Leg Curl	3 - 4	6 - 10
5	Crunches	2 - 3	15 - 20

3-Day Split: Friday			
#	Exercise	Sets	Reps
1	Seated Dumbbell Presses	4 - 5	6 - 10
2	Side Laterals	3 - 4	6 - 10
3	Straight Bar Curls	3 - 4	6 - 10
4	Seated Dumbbell Incline Curls	3 - 4	6 - 10
5	Close Grip Bench Press	3 - 4	6 - 10
6	Lying Tricep Extensions	3 - 4	6 - 10
7	Leg Press Calf Raises	3 - 4	15 - 20
8	Seated Calf Raises	3 - 4	15 - 20

To discuss the 3-Day Split further, you can post in the Members' Area.

Click Here

To download a pre-printed workout chart:

Click Here

The above workout(s) should take approximately an hour. If it takes much longer then that, rest periods between sets are too long.

A good general rule of thumb is at least 2 sets of each exercise should be using approx 80% of 1RM as data suggests that's the most effective for people looking to make progress in strength who are no longer "newbies" to resistance training, which would be defined as a person with at least 6 months to one year of steady resistance training.

There are of course other exercise that can be substituted for what I recommend above and the forum, Charles P's section, etc. have lists of additional exercises to choose from.

You will also notice that this three day per week routine does not perfectly follow the meta-analysis recommendation of hitting each body part twice per week, but many people have had good success training each body part every six or seven days (including yours truly).

It's also a reality that not everyone will be able to find the time to achieve 4 workouts per week, the 3 day per week split is one of the most widely used and hence is included in this section.

The 4-Day "Upper/Lower" Split

Return to T.O.C.

The four day split that is used most often, and probably does the best job of following the findings from that meta-analysis outlined above, is splitting the body into upper and lower done two time per week each. For example:

Monday and Thursday = Upper body
Tuesday and Friday = lower body

Exercise choices would be basically the same but volume (number of sets in this case) would be reduced per workout (though total volume per week could increase). For example:

4-Day Split: Upper Body			
#	**Exercise**	**Sets**	**Reps**
1	Barbell Bent Rows	2 - 3	6 - 10
2	(Weighted) Chin Up	2 - 3	6 - 10
3	Partial Rep Deadlifts In Power Cage*	1 - 2	6 - 10
4	Flat Bench Press (Barbell)	2 - 3	6 - 10
5	Incline Dumbbell Press	2 - 3	6 - 10
6	(Weighted) Dips	1 - 2	6 - 10
7	Seated Dumbbell Presses	2 - 3	15 - 20
8	Side Laterals	2 - 3	15 - 20
9	Straight Bar Curls	3 - 4	6 - 12
10	Lying Triceps Extension	3 - 4	6 - 10

* (pins set at approx just above knees)

4-Day Split: Lower Body			
#	Exercise	Sets	Reps
1	Barbell squats	4 - 5	6 - 10
2	Leg Extensions	2 - 3	6 - 10
3	Semi-Stiff Legged Dead Lift	3 - 4	6 - 10
4	Lying Leg Curl	2 - 3	6 - 10
5	Leg Press Calf Raises	2 - 3	15 - 20
6	Seated Calf Raises	2 - 3	15 - 20
7	Crunches	2 - 3	15 - 20

To discuss the 4-Day Split further, you can post in the Members' Area.

Click Here

To download a pre-printed workout chart:

Click Here

Again, both splits should take approximately an hour. If it takes much longer then that, rest periods between sets are too long and least 2 sets of each exercise should be using approx 80% of 1RM .

The above exercises are ones that I've found to be the most productive in their respective categories. Nonetheless, there are other exercises that can be substituted: see the forum and Charles P's section for suggestions.

Lifting Basics And General Tips

Return to T.O.C.

This section contains some information for those who are new to lifting weights or using a gym. These are some very general guidelines designed to deal with commonly overlooked gym-related issues. They are in no particular order and should help the beginner on any points of confusion.

Warm Up Properly

As a rule, the number of sets and reps I write up are "post warm up" sets. That is, it's assumed you have already warmed up and the sets and reps listed are "working" sets. They are heavy enough to be productive sets and are based on the 1RM % outlined for that routine. Not every set listed has to be some mammoth maximal effort either, but if you see 6 sets listed for a body part, 4 of those sets are not intended to be warm up sets per se. Charles Poliquin's section had additional info on this. It's also often the case people over emphasize the warm up and end up reducing their performance in the weight room by overdoing it. Forty minutes of running on the treadmill followed by 10 sets of warming up, will do nothing but reduce your performance in the gym.

As a general rule, the warm up should follow the same patterns as the exercises you plan to perform. That helps prepare the muscles, joints, and ligaments, as well as help with neural patterning for the lifts. For example, if you are going to do squats, a warm up that mimics that motion is best. Using squats as an example, you might do 5 – 8 minutes on the treadmill at an easy pace, followed by squatting with just the bar for 2-3 sets of 10-15 reps, followed by light stretching.

The idea is to achieve a short, overall, whole body increase in blood flow (treadmill, etc), followed by muscle specific light resistance (generally mimicking the exercise you plan to do), followed by light stretching to get ready for the challenging sets.

I see people doing endless "warm up sets" and only a few working sets who wonder why they are not making progress. The routines I write up are generally low set affairs, as it's assumed each set will be productive. This is far superior to a routine that calls for - say - 15 sets for chest where 11 of those sets are "warm up" sets.

"I see people doing endless "warm up sets" and only a few working sets who wonder why they are not making progress. The routines I write up are generally low set affairs, as it's assumed each set will be productive."

Wear Sensible Clothing

Leave that 80's spandex at home! Just kidding. But you should wear comfortable clothing that breaths and allows a full range of motion during exercise. It's not a fashion show, so don't pay attention to the color-coordinated crew in the gym who spend more money and time on their outfits then they do working out. I find dressing in layers works best at it allows you to warm up faster and regulate body temperature easily as the workout progresses.

Home Vs. Gym - Pros And Cons

As a rule, I am not a huge fan of home gyms. It's not that one can't design an effective and affordable home gym, it's just that it takes a very motivated person to use it. I know far too many people who have home gyms gathering dust or being used as a place to hang wet clothes; and only a handful of people that regularly use their home gym. If you are one of the few in the latter group, and are not distracted by the phone, the TV, the various house demands, the kids, etc, then a well thought out home gym can be an effective way to workout.

Forget fancy machines that make all sorts of silly claims. Not one of them is as effective - or allows as many variations of exercise - as a barbell with an adequate selection of weights, a rack of dumbbells, a flat bench, and a power rack of some kind. That's all that needed for an effective home gym. However, for $40 a month (that's what my membership to the local Gold's gym costs), I can use millions of dollars worth of equipment, get away from any distractions of the house, and look at the cute members of the opposite sex…I consider that a bargain and money well spent.

Some people will have both a home gym and a gym membership, and perhaps that's the best of all possible worlds. All I can say is, after 25 years of lifting weights, I have not been the least bit interested in a home gym for the reasons already mentioned.

Don't Ignore Injuries

Remember, it's not a race. Injuries should be addressed and not ignored or "worked around" until one knows what is causing it. Some injuries can be worked around, some can't. Only a consultation with a medical profes-

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sional experienced with sports/exercise related injuries can help you figure that out. If it hurts, don't do it. Visit the forum for more specific advice and examples of dealing with various injuries.

To discuss injuries/rehab further, you can post in the Members' Area.

Click Here

Use Good Exercise Technique

To avoid ending up in the previous section with injuries and get the most from your workouts, good form is a must. It's a very common sight to see people in the gym – in particular young men who want to look cool and impress their pals – using weights far beyond their reach with terrible form. They bounce the bar off their chest when benching, swing the dumbbell up when curling, and load the leg press up with 10 plates on each side, only to move the weight an inch and a half in what looks like a twitch vs. a full range rep. Don't be one of these people!

We have resources available to help you. Please read through the list of exercise descriptions that follow this section, along with the principles outlined by Charles Poliquin in his "21 'Training For Mass' Principles" report. There are also various threads on the forum that deal with different body part specifc exercises, along with a series of exercise videos. If you're not sure about your technique, ask.

There are many top strength coaches who have all manner of approaches and opinions about the most successful way to gain strength or increase muscle mass or performance. The one thing they all have in common is they are absolute sticklers for proper form!

To discuss your workout further, you can post in the Members' Area.

Click Here

View the Exercise Videos.

Click Here

Remember: More Is Not Better

This ties into the last two sections, of course. Too many sets, staying in the gym too long, using weight that is above what can be performed with good form, etc. leads to overtraining, injuries, and a general lack of progress. There is a fine balance that needs to be struck between adequate stimulus for muscle growth and overtraining, but more = better is rarely the case.

Use Progressive Resistance

Of all the general rules of weight training, this the most basic of them all. It is the absolute core concept in weight training. No matter what program you follow, if you fail to follow this essential concept, you will not make the progress you want.

The body responds in direct relation to the concept of progressive resistance if an increase in LBM or strength is the goal. If you are still using the same weights you were using 6 months ago – without any changes in other variables such as time under tension, time between sets, volume, etc., you are not following this essential concept! If your goal is to get stronger and or add more muscle, then your program must be set up so that you use progressively heavier weights and/or manipulate other variables that increase the stimulus to the muscles.

It should be noted that progressive resistance does not always mean more weight on the bar per se. It could also be the same weight on the bar but with shorter rest periods between sets, or an extra set with the same weight, etc. See Charles Poliquin's section for more info and discussion on this issue.

Keep Detailed Records

Many of the most successful people I know in bodybuilding, powerlifting, or Olympic lifting, are fastidious record keepers. They keep detailed records of every workout (sets, weights used, etc.) in order to track their progress. Keeping records allows you to know how much progress you make over time. People can only remember so much about a workout. Sure, you can remember last week's bench press session, but can you remember what routine you were doing three years ago? What effects that routine had on your overall success?

Use the many online workout tracking sites, or download one of the workout forms from the forum and take it with you to the gym.

To download pre-printed or blank workout forms:

Click Here

Keep Mixing Up Workouts, Variation Is The Key

This rule will change depending very much on the program you are following, so it's not written in stone. However, it's essential the program you follow varies in your choice of exercises, changes in reps or tempo, etc. Doing exactly 6 sets of squats for 8 reps every leg day for months on end will yield sub par results in both strength, performance, and muscle mass. You will see that Charles Poliquin alters these variables in his training section and you will see how I manipulate these variables in my bonus "Hybrid Training System" report, which is included in this e-book.

Personally, I rarely do the same workout even twice in a row, be it a change of exercise, number of reps, order of exercises, volume, or what have you. Make sure your program includes enough variation in the variables to prevent stalling your progress. Most programs will need a major overhaul every 8-12 weeks.

"Personally, I rarely do the same workout even twice in a row, be it a change of exercise, number of reps, order of exercises, volume, or what have you. Make sure your program includes enough variation in the variables to prevent stalling your progress."

Keep Time To A Minimum; 1 Hour Is Adequate

This basic rule comes mostly from early studies that find at about the hour mark, anabolic (muscle building) hormones (such as testosterone) go down, while catabolic (muscle wasting) hormones (such as cortisol) go up. The general wisdom is that it's counterproductive to be in the gym hitting the heavy weights beyond an hour.

Don't freak out if your workout lasts one hour and two minutes. You need to remember that it's a very general rule so a workout that lasts an hour and 15 minutes probably won't have any dire effects on your progress. There is no particular reason, however, to be in the gym beyond an hour if you're training correctly. If you are working hard enough, you should not be able to stand anything beyond an hour!

Charles also has additional thoughts on the one hour rule in his section.

Start With The Basics: Forget Isolation Exercises For A While

You will always get your best "bang for the buck" by sticking to large muscle groups and multi-joint exercises such as squats, bench press, bent rows, deadlifts, and so on. Stimulating the most muscle fibers possible is the goal, not doing endless sets of cable cross overs or concentration curls.

Isolation exercises may have a place in the routine of some advanced athletes (and that's debatable) but they have no place in the routines of 95% of the people reading this section. Sure, some times you just need to mix it up and that's fine, but your program should rely heavily on the multi-joint exercises that move the most amount of muscle/motor units during that exercise. See my bonus training report as well as Charles's for good choices.

Mix Up Machines And Free Weights

This may come as a surprise to some, but I don't hate machines. Some strength coaches out there are very anti-machine. Let me be clear: if I could only choose one, I would take the free weights every time. However, if you train in a well-equipped modern gym, you don't have to choose one over the other and they can be nicely combined. As a general rule, free weight exercises are more productive for various reasons, but the common sense use of machines can have their place in a well-designed routine.

One of the major gripes regarding machines is less about the machines, and more about the way that people use them. They rely too much on machines and avoid the more productive free weight exercises. While machines seem safer, a reliance on machines may also increase your risk of injury (contrary to what some believe). This, along with other reasons, is why machine exercises shouldn't dominate your routine.

Work Large Body Parts First

This rule fits in well with what I have already covered in the above. Any properly designed routine will generally start with the larger muscles groups, followed by smaller muscle groups, such as shoulders following chest, biceps following back, or calves following thighs and hamstrings. Larger muscle groups take the most energy and effort, so getting them

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done first is just common sense.

Make Use of Pre- And Post-workout Nutrition

Although not directly related to lifting weights, don't forget the pre- and post-workout nutrition recommendations found in this e-book. It stands to reason that you want to get the most from your hard work in the gym. Study after study tells us the key – nutritionally speaking - to optimizing our efforts in the gym is proper pre- and post-workout nutrition. If you need more advice on this, check out the "Pre- and Post-Workout" section on the forum.

To discuss Pre- and Post-Workout Nutrition further, you can post in the Members' Area.

Click Here

Exercise Descriptions

Return to T.O.C.

Quads/Hamstrings

Barbell Squats

Set a barbell in a power or squat rack at roughly shoulder level. Take the bar on your shoulders, across your traps, and step away from the rack.

Take a roughly shoulder width foot stance with toes pointed only slightly outward. Again, there are variations in stance, but for bodybuilding purposes, a relatively narrow- or medium-width stance is generally used. A narrower stance also dictates a more upright posture. Feel free to modify bar height and/or stance depending on your goals for muscle recruitment.

Prior to descent, bend your knees slightly, tighten your lower abdomen, and contract your glutes. During the descent, flex back at the hips, but maintain your pelvic position in relation to your spine.

Squat as deeply as possible without exceeding 45-degree trunk flexion relative to vertical (for the "bodybuilding" version of the squat). Again, the upright posture is preferred mainly for bodybuilding purposes and not intended to maximize the weight used for the exercise.

If your flexibility allows it, descend below a parallel-thigh position to where hams and calves are nearly contacting. Do NOT rest or take tension off the musculature at the bottom. Keep your knees an equal distance apart during the entire lift.

Prior to ascent, contract your glutes and hold them during the concentric (lifting) portion of the exercise. Stop your knee extension just short of lockout. When you have ascended to your starting position, this is one rep.

Online Video:

Click Here

Leg Extensions

Sit in the machine as described on the label on the machine. Machines will vary in terms of proper positioning; when in doubt consult a qualified instructor.

Place your feet so that the pad roller is just above your feet across the front of your ankles. Extend your knees so that your legs become straight.

Keeping tension on the musculature, slowly lower the pads back to the starting position. Do not lower all the way to the point where tension is released.

Online Video:

Click Here

Semi-Stiff Legged Deadlifts

Take the bar out of the supports and step back. These are best done on an elevated platform. You should have a shoulder width stance. Bend your knees slightly. The knee angle should not change during the lift; maintain this slightly bent position.

Flex forward from the waist, letting the bar hang in your hands below your shoulders. Look forward and keep a flat back. Flex forward until further flexion would cause rounding of the back. Round-back lifting is not absolutely contraindicated, but it is best reserved for trainees with a lot of experience and muscular strength and control. For most trainees in most situations, it's best to learn the flat-back version first. The bar should drift away from your body naturally as you descend, hanging from your arms.

Reverse the movement to raise the weight. Flex your glutes hard on the ascent.

Online Video:

Click Here

Lying Leg Curls

Lie prone (face down) on a lying leg curl machine. The roller pad should contact just above your heels.

Curl the weight until the pad almost touches your glutes, and lower it under control. Keep as much of the front of your body as possible in contact with the bench throughout the exercise. For this, and all leg curls, a trick to shift emphasis away from the gastrocnemius (calf muscle, which assists in knee flexion) to the hamstrings is to keep your toes plantarflexed ("pointed") throughout the exercise.

Online Video:

Click Here

Back

Partial Rep Deadlifts In Power Cage

Set the supports in the power cage to the range of motion you want to work on. A good starting point for this exercise is to set the supports so that the bar is just below your knees at the start. Place the barbell in the rack, resting on the supports.

Start with a shoulder width stance, squatting down to grasp the bar. Use a pronated (palms down) grip or a mixed grip (one hand pronated and the other supinated or palm up). Powerlifters must use the mixed grip in competition; however, this grip is associated with biceps tears if done improperly. For most non-powerlifters, most of the time, those who are using the deadlift for bodybuilding or general strength training purposes, the pronated grip (often requiring straps with heavier loads) is probably best. Understand that you lose a lot of the grip-training effect if you use straps, however.

The bar should be as close to your shins as possible at the start. Your shoulders should be vertically over the bar. Your butt should be down. Keep your lumbar spine flat or even slightly concave. Your scapulae (shoulder blades) should be retracted and depressed (brought together and lowered) in the start position.

Initiate the movement by extending your legs, contracting your abs and glutes to maintain pelvic and spinal alignment, and maintaining contraction in your middle back (maintaining scapulae retraction). You are essentially performing "the second pull" of a regular deadlift. The second part of the pull involves pushing your hips forward. This drives the bar to the top of the lift. Keep a flat back and keep the bar as close to the body as possible.

At the top, do not hyperextend the lower back or move the shoulders. Lower the bar in approximately the reverse sequence.

For practical reasons, it may not be possible to keep the bar quite as close to your body on the way down. Still, strive to do so. Continue to maintain your flat back position throughout the exercise.

Pull-ups/Chin-ups

Classically, pull-ups are done with a pronated (palms facing away from you) grip. Chin-ups are done with a supinated (palms facing towards you) grip. Chins can also be done with a parallel grip and with varying widths of grip.

Grasp the chin bar with the chosen grip. Keep your back flat or slightly concave, and look upwards. Your knees should be bent and your lower legs crossed.

Use your lats to pull yourself up to and over the bar. Your chin should be above the bar at the top. Squeeze your scapulae together at the top, and allow them to drift apart naturally at the bottom.

Lower yourself under control and do not take tension off the musculature in the bottom position.

Tip: Use a belt to add resistance.

Online Video:

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Barbell Bent Rows

Grasp a barbell. Stand with a shoulder width, overhand grip, slightly bent knees, a flat back, and your head up.

Bend over at approximately a 45-degree angle at the waist. Several trunk angles are advocated; none are better than the others and all should be used. Pick a particular angle and stick with it for a training cycle. For the 45-degree trunk angle, pull the bar to your lower sternum.

Pull the scapulae together at the top, and allow them to drift apart naturally at the bottom.

Tip: Maintain a flat back throughout the movement.

Chest

Incline Dumbbell Presses

Lie on an incline bench. Resist the temptation to always use a low incline. All levels of incline should be used at one time or another for balanced development.

Take a pair of dumbbells and kick them off your knees to a position just above your clavicular ("upper") pectoralis major. Your elbows should be pointing at the ground, your feet should be planted on the ground, and you should be looking ahead, which could be anywhere from the ceiling to the wall in front of you.

Press the dumbbells together overhead. Two schools of thought for bar path apply here as they do for the bench press. Select one or the other based on your goals. Do not bang the dumbbells together. This takes tension off the muscles and serves no muscle or strength building purpose.

Online Video:

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Dips

Stand in the parallel bar dip station and grasp them so that your forearms

are perpendicular to the ground. If the bars are in a V-shape (i.e., not parallel), you should be facing the V.

For a chest emphasis, allow your elbows to drift apart to a comfortable location. For a triceps emphasis, keep your elbows pointed strictly behind you.

Start from a fully extended elbow position. Descend while keeping your back flat, chest and head up, knees flexed, and lower legs crossed. Your flexibility should dictate the range of motion, but in general, attempt to get your upper arms to parallel relative to the ground. It is fine for your upper arms to go below parallel if this doesn't cause you discomfort or injury.

Don't bounce at the bottom, and ascend in the reverse movement.

Tip: Use a belt to add resistance.

Online Video:

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Flat Barbell Bench Presses

Lie on the bench so that you will unrack the weight at a point directly above the top of your head. It's best to have a spotter help you unrack the weight, so as to prevent any undue stress on your rotator cuff muscles.

Grip width is highly variable from trainee to trainee, but essentially your goal on a standard bench press is to use the grip width that allows you to move the most weight in good form. For most people, this is a few inches greater than shoulder width.

In general, lower the bar under control to your lower sternum (approximate nipple level for men). Keep your feet planted on the ground, your butt and upper back firmly on the bench, and your scapulae retracted throughout the movement.

Although some advocate a "J" bar path to directly over your face at the top of the movement, a strict vertical movement is neither better nor worse. Bodybuilders tend to favor the former method because the bar travels through a greater range of motion, while powerlifters tend to favor the

latter method because the bar travels a shorter distance and greater load can be used. Whatever the bar path, bring the bar to just short of elbow lockout.

While some spinal extension is tolerable and in fact, necessary, don't overdo it. The glutes should not leave the bench during the bench press. Ever.

Control the bar on the descent, and do not bounce the bar off the chest. It's been shown that the best bench pressers in the world have a slower descent than those who bench less. Keep a neutral wrist alignment.

Tips: Have a spotter help you unrack/rack the weight. A spotter is a good idea for all pressing exercises with a barbell, especially when using heavy loads.

Online Video:

Click Here

Shoulders

Seated Dumbbell Presses

Sit on a flat bench or vertical seated bench. In general, the flat bench will be more conducive to good form and balanced development.

Grasp two dumbbells and kick them with your knees to shoulder level.From this position, press them overhead. Do not bang the weights together at the top, and do not lock out the triceps completely.

Reverse the movement to the bottom position, and do not take tension off the musculature.

Online Video:

Click Here

Side Lateral Raises

Grasp two dumbbells and stand with them at your sides, palms facing towards you. Keeping your elbows very slightly bent and maintaining this

degree of flexion, lift your entire arms out to the side, as if pushing two walls apart.

Lift as high as is comfortable and safe for your capabilities, generally just above parallel, but for many trainees a safe range will be much less.

Maintaining tension on the musculature, slowly lower the dumbbells back to your side.

Online Video:

Click Here

Biceps

Straight Bar Curls

Grasp a barbell with an underhand grip. Hold it in front of you so that it is across your thighs.

Keeping your back flat and your shoulders back and still, flex at the elbow only to curl the weight up. Do not bring it too high as this will take tension off the appropriate musculature.

Lower the weight under control, maintaining tension on the musculature at all times.

Online Video:

Click Here

Seated Dumbbell Incline Curls

Lie on an incline bench. Again, no incline angle is better than the other. Each produces slightly different motor unit recruitment and thus they all should be used. Choose one and stick with it for a training cycle.

Take two dumbbells and hold them with a supinated (palms up) grip. Let your arms hang naturally down from the bench without losing tension on the musculature.

Using your elbows only, curl the weights up as high as possible while maintaining tension on the musculature. Bringing the weights too high in arm curl exercises takes the tension off the elbow flexors and decreases their effectiveness.

Lower the weights under control to the start position.

Triceps

Lying Triceps Extensions (EZ-Bar)

Take an EZ-bar and lie on a bench. Hold the bar, with a pronated (palms down) grip, vertical with elbows extended.

Lower the bar to about your forehead level while keeping your elbows pointed upwards. Some lateral flaring of the elbows is permissible and does not constitute bad form. The important point is to not move from the shoulder joint.

Reverse the movement to the top.

Close Grip Bench Presses

Find a flat bench. Take the bar at about a shoulder width grip or slightly narrower.

Bring the bar to your lower chest while keeping your elbows tucked at the sides of your torso. Your arms should make a straight up-and-down movement during the exercise, and shouldn't flare laterally to a significant degree.

Reverse the movement, and return to the starting position. Bring the bar to just short of elbow lockout.

Tip: Have a spotter help you unrack/rack the weight.

Calves

Seated calf raises

Sit on the machine with your knees able to fit under the pad. Adjust your

feet so your heels can extend below the balls of your feet on the platform. Make sure the safety latch is on the machine before starting this exercise.

Take the safety latch off of the machine. Begin by raising your heels as high as possible, Squeeze your calves then slowly lower the weight to the stretched position.

Perform this exercise slowly and controlled. Never rock back and forth to get the weight up. Use lighter weights and do higher reps (20-50 reps) per set. On the next workout, go heavier or do more reps. Always change your foot position.

Online Video:

Click Here

Leg Press Calf Raises

Sit in the machine as described on the label on the machine. Machines will vary in terms of proper positioning; when in doubt consult a qualified instructor. Place your feet on the bottom of the platform so that the balls of your feet are contacting the platform, but the heels are not.
Extend your knees so that your legs are completely straight. The platform should be well above the safety supports at this point. Keep the safety supports engaged.

Flexing only at the ankle, allow the platform to come towards you slightly (as much as your range of motion will allow).

Then, again only moving at the ankle, push the platform back up. Keep your knees close to lockout and fixed throughout the exercise.

Tip: There is an important safety tip for this exercise: KEEP THE SAFETY SUPPORTS ENGAGED THROUGHOUT THE EXERCISE. Not doing this can result in serious traumatic injury.

Online Video:

Click Here

Abdominals

Crunches

Lie supine (back down) on the ground with your feet on the ground. Put your hands near, but not touching, your forehead.

Flex your spine upwards as much as your flexibility will allow. Do not anchor your feet under anything or anyone. Don't flex from the hips. Spinal flexion is the goal in this particular case, not hip flexion.

Maintain tension throughout the exercise as you lower your torso back to the ground.

Tip: Hold a dumbbell over your chest or hold a rope attachment from a low pulley to add resistance.

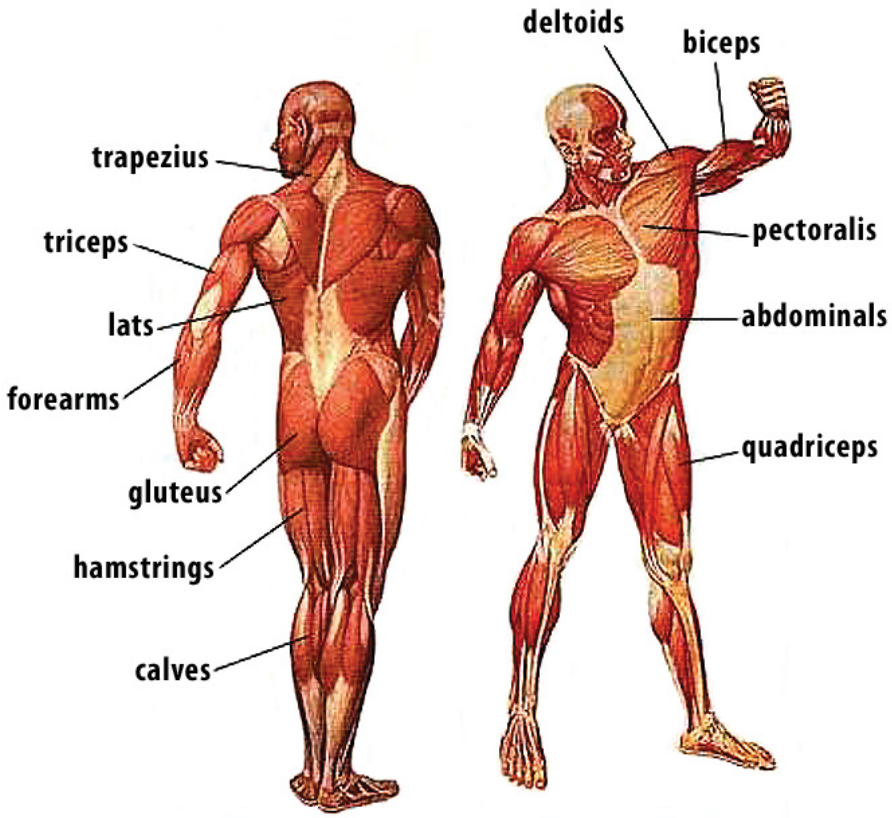
Online Video:

Click Here

Body Map

Return to T.O.C.

In the image below, you can see an abbreviated body map showing the major muscle groups that you will be concentrating on while following the workouts. The table on the next page shows each of the major muscle groups, along with their anatomical names as well as the names body-builders use (in brackets). The table also gives a brief explanation as to the exercises and activities that recruit each of the muscle groups.



This map corresponds to the one in the Members' Area, which you can use to access a series of exercise videos appropriate for each of the major muscle groups.

To access the Exercise Videos in the Members' Area:

Click Here

Figure 10: Body Map Table. These are the different actions each major muscle group performs along with the exercises that work each one.

Muscle	Action	Activity
Trapezius **[Traps]**	Draws head backwards either side, raises shoulder girdle	Shrugging motion, neck work, overhead work and lifting to shoulders
Triceps **[Tris]**	Extends forearm	Pressing in most forms, all extension movements, overhead lifting and supporting.
Latissimus Dorsi **[Lats]**	Draws arm downward, backward, and rotates it.	One & two hand rowing movements, upright rowing, pulldowns, pull ups, pullovers, bench press.
[Forearms]	The forearm can either flex or extend depending on the muscle used with in the forearm group	Pinching, gripping, wrist extensions, cleaning weights to shoulders, using thick handled weights.
Gluteus Maximus **[Glutes]**	Extends thigh and rotates it outwards.	All knee-bending movements, full, half, and partial squats, deadlifts, leg extensions, leg pressing.
Biceps Femorus **[Hamstrings]**	Flexes leg, rotates it outwards, aids in extension.	Leg curling, stiff leg deadlifts, most exercises involving thigh and hip, deep squats with wide stance.
Gastrocnemius **[Calves]**	Extends foot.	Calf raises, standing on tip-toe, all forms of calf work, stiff leg deadlifts.
Deltoids **[Delts]**	Raises arm to shoulder level and aids in pressing movements.	All forms of forward and lateral raises, pressing movements, overhead lifts, dips, etc.
Biceps & Brachialis **[Bis]**	Flexes and supinates forearms and adducts arms.	Curling, reverse curling, chinning, pulldowns, all lifts to shoulders, all rowing, lat machine, etc.
Pectorals **[Pecs]**	Draws arms forward and inward, aids in rotating arm inward.	All supine, decline, incline presses, bent-arm pullovers, all flying movements.
Rectus Abdominus **[Abs]**	Flexes & stabilizes midsection, compresses viscera, depresses thorax.	All situps, crunches, roman chair, knee raises; all bending and twisting movements.

Chapter 7: Cardio/HIIT

Does Cardio Help...Or Hinder Muscle Gain?

Return to T.O.C.

The answer is...yes.

Confused? I'm sure you are. Ever since Ken Cooper's book, "Aerobics" was first published in 1968, aerobic exercise has been sold - and oversold - as the primary form of exercise for losing weight and/or getting fit. Thousands of books and articles have been published since then, all extolling the virtues of aerobic exercise - particularly endurance training - for improving health and body composition. You can't swing a cat without hitting a jogger. Visit any city recreation center, and you'll see a number of cardio classes being offered. Even in most gyms, the floor space devoted to cardio machines and classes vastly exceeds the space devoted to free weights and associated equipment (e.g., benches, power racks, etc.). It's not surprising that when people start a fitness program, the first thing they think of is cardio.

There are some problems with this view, especially for the person who wants to add muscle. When was the last time you saw someone with a perfect lean and muscular physique who got there by concentrating on cardio training?

The answer is: "never". I've seen plenty of lean people who focus on cardio training, but they look thin and undermuscled. You're not reading this book because you want to look like a marathon runner. The reality is that focusing on cardio is not only useless for building muscle, but can actually be counterproductive.

Excessive cardio:

- utilizes calories needed for building muscle;
- depletes glycogen stores;
- increases physical stress, stimulates cortisol production and decreases the testosterone/cortisol ratio ;
- reduces both total and free testosterone levels;
- increases oxidative stress and free radical production;
- oxidizes amino acids needed for muscle growth/repair;
- increases risk of injury (especially higher impact activities);
- impairs recovery from strength training;
- can reduce power output

- can lead to overtraining.
- can induce conversion of fast twitch muscle fibers to slow twitch.

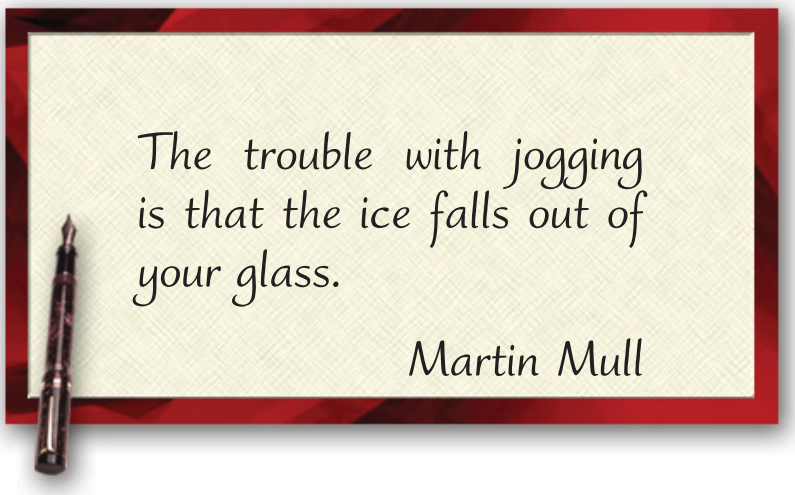
When it comes to cardio, more is definitely not better!

But what about the benefits of cardio? Surely all those books and articles can't be wrong!

Ok, let's take a look at the benefits. Cardiovascular exercise can:

- increase VO_2max (ventilatory oxygen uptake);
- increase blood flow to exercising muscles;
- improve blood lipid profiles;
- enhance insulin sensitivity;
- reduce fat mass and improve fat distribution;
- improve exercise capacity/endurance;
- reduce the risk of cardiovascular disease;
- reduce blood pressure.

Obviously, we want to do enough cardio to accrue the benefits, while minimizing the drawbacks. Some cardiovascular training can be useful to athletes looking to add mass and strength, but it needs to be kept within limits to avoid compromising gains. In the sections that follow, we'll explore the various pros and cons to come up with ways that you can optimize your cardiovascular training and conditioning, without overtraining or sacrificing any hard-earned muscle.



Cardio And Fat Burning

Return to T.O.C.

If you're a bodybuilder - or want to look like one - it's safe to say that you want to be as lean as possible. And no matter how clean your diet is, body fat is always going to be an issue. If you're gaining, you want to minimize fat gains, and if you're cutting, you want to accelerate fat loss. While doing cardio for cardiovascular fitness is important, the main reason most bodybuilders do cardio is to get as lean as possible. And certainly cardio can help with fat loss: it's one of the things I recommend to people looking to lose fat in my other e-book: "Fat Loss Revealed".

In the traditional view of things, prolonged, steady-state cardio is the best means for either reducing or keeping fat gains down, thanks to what is known as the "Fat Burning Zone".

This requires some explanation...when we eat food, our bodies convert it into forms that are used to fuel our activities. Whether we're sleeping or training, we burn the same preferred substrates for fuel: carbohydrate and fat. The only thing that changes is the percentage of each that gets used for different activities.

Both carbohydrates and fat combine with oxygen (O_2) during the process of being broken down to carbon dioxide (CO_2) and water. Thus, it's possible to measure the contribution that each makes by measuring the ratio of the gases inhaled vs. those exhaled during exercise. The volume of CO_2 produced divided by the volume of O_2 consumed is called the Respiratory Exchange Ratio (RER).

There are some equations involved, and I won't bore you with them. The bottom line is: if only fat is being utilized for energy, the RER has a value of 0.7. If only carbohydrate is being used for energy, the RER works out to 1.0. An RER value between 0.7 and 1.0 means that a mixture of fat and carbohydrate is being broken down for energy. It's also possible to have an RER larger than 1.0: this means that CO_2 is being produced faster than O_2 is being taken in.

There are a lot of technical details involved, but the main point to remember is this: as the measured RER approaches 1.0, the percentage of fat being burned for energy decreases.

Why is this important? Because measurements of RER have shown that higher intensity exercise uses proportionally less fat to fuel the activity than lower intensity exercise does. One small study on 9 male football players exercised at different intensities came up with the following numbers:

Exercise Level (km/h)	Mean RER
Rest	0.74
8	0.83
10	0.88
12	0.90
14	0.99
16	1.00
18	1.09

(From Maiolo et al., 2003)

As you can see from the data in the table, RER increases with the exercise level. This means that a greater amount of fat is being utilized at rest and during lower intensity exercise, while little or no fat is being used at the highest intensities.

So to tie it all together, the relationship between exercise intensity and fat oxidation during exercise is behind the idea of the "Fat Burning Zone" (FBZ). The FBZ is the level of intensity that maximizes the use of fat to fuel the exercise. The FBZ seemed to be confirmed by research. For example, one study compared the fat and carbohydrate utilization of ten men, who cycled either at 33% VO_2max or 66% VO_2max on separate days. The study found that the lower intensity exercise burned more fat (42.4 g vs. 24 g) and less carbohydrate (142.5 g vs. 188.8 g) than the moderate intensity exercise.

A 2002 study, "Determination of the exercise intensity that elicits maximal fat oxidation"' provided additional confirmation. The study monitored the fat oxidation rates of 18 moderately trained cyclists over a series of prolonged, continuous exercise tests using constant work rates. The researchers found that the range for optimal fat oxidation was from 55% to 72% VO_2 max. This corresponds roughly to 69% - 80% MHR (maximum heart rate). This was a small study with a lot of variation between the subjects, however. A later study using a much larger group of untrained men and women put

"Fat_{max}" at 48.3% VO_2max, or approx. 61.5% MHR.

So exercising in the FBZ must be the best way to work off excess body fat, right?

Maybe not: one problem with the FBZ concept is that only the ratio of the fat vs. carbohydrate being burned for energy is considered; not the overall fat calories or total calories burned. Lower intensity exercise may use a higher percentage of fat calories, but burns fewer calories overall than higher intensity work. You can burn just as many total fat calories if you increase the intensity: the percentage of fat used may be smaller, but since you're burning more total calories, it evens out.

I think most people trying to lose fat would agree that burning more calories is better than burning less.

More importantly, measurements made only during exercise are misleading, since they don't account for changes in fat oxidation or metabolism that occur after exercise. As you increase the intensity, you also increase the impact that exercise has on post-exercise metabolism. In one study on college-aged women, for example, fat oxidation during a 3 hour recovery period was considerably higher after cycling sessions at 75% VO_2max that used the same amount of energy (500 kcal) as longer sessions at 50% VO_2 max. The bottom line is that there were no significant differences in total fat oxidation between the two groups over the measurement period. The researchers also reported that the rate of fat oxidation in the high intensity group remained elevated even at the end of the 3 hour recovery period.

Another study on 24-hour energy expenditure (EE) and substrate oxidation patterns in men, showed there was no advantage to low intensity exercise with regard to fat oxidation. The researchers concluded:

*"Similarly, the differences in HI and LI exercise, RQ are compensated postexercise leading to similar substrate oxidation patterns over 24 h independently of the level of exercise intensity."**

Similar results have been obtained by others. As noted in a 2001 study:

*RQ is an alternate term for RER.

> "Similarly, the differences in HI and LI exercise, RQ are compensated postexercise leading to similar substrate oxidation patterns over 24 h independently of the level of exercise intensity."

> "Furthermore, low- and high-intensity aerobic exercise, matched for energy expended during exercise, have similar effects on 24-h nutrient oxidation. We therefore conclude that low-intensity exercise does not promote greater "fat burning," as has been popularized among the lay press."

"Furthermore, low- and high-intensity aerobic exercise, matched for energy expended during exercise, have similar effects on 24-h nutrient oxidation. We therefore conclude that low-intensity exercise does not promote greater "fat burning," as has been popularized among the lay press."

Now you might conclude from this that it doesn't matter which kind of exercise you do - the end result is the same. But in the 2004 study, for example, the high intensity (HI) exercise bouts lasted only 30 minutes each, vs. 60 minutes for the low-intensity (LI) sessions. So equivalent results were obtained in half the exercise time. To quote again from the 2001 paper:

"Given that time is a limiting factor for most individuals, we would also suggest that, if the goal of exercise is to maximize fat oxidation to better regulate body fat mass, then exercise should be performed at the highest intensity that can be comfortably maintained. "

So what's the take home lesson? There's little point to spending long periods of time doing low-to-moderate intensity cardio for fat loss...unless you enjoy that sort of thing. When it comes to fat burning, higher intensity exercise works just as well as lower-intensity exercise, and you'll spend less time doing it. Looks like a bargain to me.

There are also other reasons to raise the intensity of your cardiovascular exercise that extend beyond simple fat burning, which are discussed in the next section.

"Given that time is a limiting factor for most individuals, we would also suggest that, if the goal of exercise is to maximize fat oxidation to better regulate body fat mass, then exercise should be performed at the highest intensity that can be comfortably maintained."

Exercise Intensity And Energy Systems

Return to T.O.C.

In addition to burning fat, people do aerobic exercise for cardiovascular conditioning. Aerobic exercise can definitely improve endurance and heart/lung capacity...to a point. Beyond that, adaptation occurs and a plateau is reached. You'll maintain whatever level you reach, but that's it. No surprises here: we need to change up our weight training and increase the challenge to continue to see improvements, so why should cardiovascular training be different?

The problem with traditional cardiovascular exercise is embodied in the popular term used for it: "aerobic". Aerobic literally means, "with oxygen". Although most people don't think about it much, the word refers to a metabolic pathway our bodies use to produce energy. It's a major pathway: without aerobic respiration, our bodies would be unable to produce enough energy for the various biochemical and physical processes we need to live. When we do aerobic exercise, what we're doing is expanding our capacity to produce energy to fuel the activity. There are specific adaptations that take place at the cellular level: changes in the number of mitochondria and the amount and activity of mitochondrial proteins.

It's important to understand, however, that aerobic respiration is not the only energy pathway in existence. Other pathways exist that make a significant contribution to athletic performance. In fact, optimal athletic performance - even endurance performance - isn't possible when you train only one energy system. The bottom line is: if you only train aerobically, you're not training - or expanding the capacity - of other energy systems that are important to optimal performance.

What are these other energy systems and what do they do? These are the:

- Phosphagen, or ATP-CP (creatine phosphate) system: this provides energy for very high intensity/power, short duration activities.

- Oxygen-independent, glycolytic system: an older name for this was the "lactic acid" system, which should be immediately recognizable for anyone who's ever felt "the burn" while working out. This could be thought of as a system capable of providing energy for activities of intermediate intensity and duration.

- Aerobic energy system: this is what we've been discussing over the last few pages. The aerobic system provides energy for lower intensity/power, long-duration activities.

These different metabolic pathways are not mutually exclusive: for any given activity, there is a certain amount of overlap. How much of a contribution that each one makes depends on the activity. The longer the duration of the exercise, however, the greater the importance of the aerobic pathway. An over-reliance on long-duration, lower intensity exercise then, ultimately neglects the other two systems, and will do little to expand our capacity to use them. To be truly fit, then, we need to get out of the traditional cardio rut, and work at intensities that require energy from non-oxygen dependent pathways.

"When assessed as a continuous variable, exercise intensity was related to a reduction in risk of 4% for each 1-MET increase independent of the total exercise volume."

What are the benefits of working at a higher level of intensity? A picture is worth a thousand words: consider the physiques of sprinters vs. marathon runners. These are extreme examples, but make the point. Sprinters are just as lean as their long-distance counterparts, but are far more muscular. Yet I don't think anyone would claim that sprinters lack cardiovascular fitness. In fact, higher intensity exercise appears to offer additional protection against cardiovascular disease. Analysis of the data collected in a long-term study of 44,452 men on the relationship between exercise activity and risk of coronary heart disease (CHD) concluded:

"When assessed as a continuous variable, exercise intensity was related to a reduction in risk of 4% for each 1-MET increase independent of the total exercise volume."

Beyond simply working at a higher level, the exercise pattern is also important. Combining short, high-intensity sprints with slower-paced recovery periods, known as interval training, offers greater benefits than steady-state training alone.

Interval training has significant effects on the primary measure of aerobic fitness, VO_2max. In a study conducted in 1998, 12 healthy, young, recreational exercisers participated in a 3x/week program consisting of 30-second maximum-intensity intervals for 7 weeks. The protocol featured an increasing number of intervals, coupled with decreasing recovery periods. At the end of the 7 week period, the researchers reported significant gains in VO_2 max, oxidative enzymes and power output. The researchers concluded:

"The significant increase in O_2 max and the large increases in muscle oxidative enzyme activity were somewhat unexpected given the nature of the training stimulus and its brevity. Changes of this magnitude are usually associated with training programs involving several hours per week at submaximal exercise intensity...."

Two recent studies tackled the subject directly: in the first study, the goal was to determine the influence of sprint-interval training (SIT) on aerobic exercise capacity. Eight recreationally active cyclists performed sprint interval training using a 30 s maximal-intensity sprint sessions 3x/week for 2 weeks (total of 6 sessions). After the 2 week experimental period, the researchers found significant improvements in oxidative enzyme activity and resting muscle glycogen content. More importantly, they found a 100% increase in submaximal (80% VO_2max) cycling endurance capacity.

In other words, in two weeks time, the subjects doubled their capacity to do "traditional" cardio work.

In the second study, the effects of SIT were compared directly to traditional cardio. 16 active men were assigned to two groups: an SIT group using 4 - 6 repeats of 30 second, all-out, sprint cycling intervals; or an endurance training (ET) group that exercised at 65% VO_2 max for 90 - 120 minutes. Both groups exercised 3 times/week for two weeks (total of 6 sessions). The researchers found that both types of exercise produced similar improvements in muscle oxidative capacity, muscle buffering capacity and exercise performance. But the total exercise time over 2 weeks was only 2.5 hours for the SIT group (including recovery periods), vs. 10.5 hours for the ET group. Not only that, but the total training volume for the SIT group was only 10% of the ET group (630 kJ vs. 6500 kJ).

Lower volume, less time for the same benefits...hmmm.

While there's nothing intrinsically "wrong" with doing traditional cardio - as long as it isn't overdone - it should be clear by now that it's not the be-all and end-all that the popular media has made it out to be. The take home lesson from this and the previous section is that higher-intensity, interval training can accomplish at least as much as conventional cardio can - if not more - while slashing the amount of time and work needed to do it.

"The significant increase in O_2 max and the large increases in muscle oxidative enzyme activity were somewhat unexpected given the nature of the training stimulus and its brevity. Changes of this magnitude are usually associated with training programs involving several hours per week at submaximal exercise intensity...."

High Intensity Interval Training and Tabatas

Return to T.O.C.

There are a lot of different ways to do interval training: the length of the intervals and recovery periods vary, as well as the form the exercise takes. Sprint running on a track/treadmill or riding an exercise bike are a couple of obvious choices, but certainly others can be used. Whatever exercise you do, however, should be something that you can start and stop quickly. Typical intervals last 15 - 60 seconds, followed by 30 seconds - 4 minutes of recovery. Start with doing 4 - 5 intervals, and work up to 8 - 10. Initially, longer recovery periods may be needed, but should be reduced as your fitness increases.

Beginners should start with one session per week and work up to 2 - 3 per week. Sessions should be kept short, lasting no more than 20 minutes. Be sure to warm up for 5 minutes or so before starting the workout and cooldown for at least 5 minutes afterwards.

Hybrid programs that combine different exercises and modes can be valuable too. I've written a report in the bonus section, "Brink's Hybrid Training System" that includes the details of a variation that I use, which involves interval training on an exercise bike, high-rep circuit training, and conventional cardio, for a full energy-system workout.

Some of the most impressive results have been obtained with the use of shorter intervals, and even shorter recovery periods. Most interval training routines use recovery periods that are 1 - 4 times as long as the interval. A newer training technique, known as "Tabata Intervals" uses recovery periods that are only half as long as the interval itself. In a study called "Effects of moderate-intensity endurance and high-intensity intermittent training on anaerobic capacity and VO_2max", Izumi Tabata compared two 6 - week training programs. The first consisted of 7 - 8 cycling intervals lasting 20 seconds each at 170% VO_2 max, with only 10 seconds of rest in between. The second consisted of 60 minutes of steady cycling at 70% VO_2 max. The interval workouts - which lasted only 4 minutes - yielded greater improvements in VO_2 max than the longer, submaximal workouts (7 ml/kg/min vs. 5 ml/kg/min), and increased anaerobic capacity as well (+28% vs. no change).

Although the work and "rest" intervals are fixed, you can vary the exercises

"Beginners should start with one session per week and work up to 2 - 3 per week. Sessions should be kept short, lasting no more than 20 minutes. Be sure to warm up for 5 minutes or so before starting the workout and cooldown for at least 5 minutes afterwards."

much the same as with other interval training. One variation that's growing in popularity is to use weight exercises, such as front squats to perform the intervals. Squatting with dumbbells is another way to try it. If you try using weights for this sort of exercise, I'd advise you to go light: the purpose of the weight to provide some resistance, it's not supposed to be a combined strength-and-cardio exercise.

There is a lot more information on high-intensity interval work and Tabata drills in the Members' Area forum. Make sure you check it out.

To discuss Cardio & Interval Training further, you can post in the Members' Area.

Click Here

To discuss Tabatas further, you can post in the Members' Area.

Click Here

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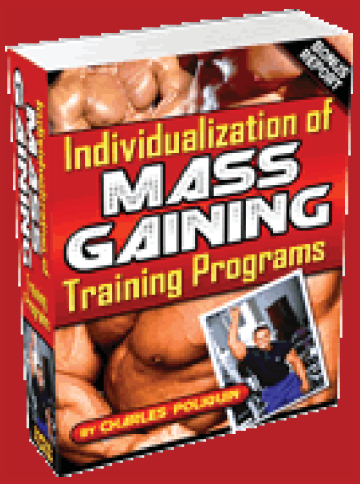
Bonus Reports

Individualization Of Mass Gaining Programs

by Charles Poliquin

Additional Reports:



An Important Reminder From Will Brink

Return to T.O.C.

If you are a beginner, or have less than 1 year of steady, progressive training under your belt, I'd advise you to stick with the routines outlined in Chapter 6. The routines outlined in this section are optimal for reasonably experienced trainees. Charles' principals are worth reading - and re-reading - by everyone, regardless of their training age, but you should have solid experience with basic exercises before attempting many of the exercise variations that Charles describes. You should also read the FAQ section at the end of this chapter. A second report, "Exercise Descriptions", provides written instructions for all the exercises used in Charles' routines.

In my opinion, Charles is the preeminent strength coach in the US; perhaps the world. His techniques are designed to extend on the progress you'll make applying the nutrition, supplementation and workout advice you've read in the preceding sections of this book. Charles has put together a list of tips, advice and routines that will help you pack on the pounds and will make you the envy of everyone in the gym.

If you have any questions on Charles Poliquin's training methods or concepts, we have a several resources to help you, both here in the e-book and in the Members' Area.

To discuss Charles Poliquin's principles/training further, you can post in the Members' Area.

Click Here

To jump to the FAQs:

Click Here

To jump to the Exercise Descriptions:

Click Here

Biography: Charles Poliquin

Return to T.O.C.

Charles Poliquin is a native of Ottawa, Canada. While completing graduate studies in Exercise Physiology in Canada, Charles began coaching athletes, a career move that has resulted in hundreds of medals, wins and personal bests of many elite athletes.

He is known worldwide for producing faster athletes. When a country wants a Gold medal, they come to Charles.

Coach Poliquin has been hailed as the most successful strength coach in the world. He has spent years-researching European journals (he is fluent in English, French and German) and speaking to other coaches and scientists in his quest to optimize training methods. He has perfected the art of writing routines that produce results, and his books and courses are the culmination of his theories and knowledge.

Charles Poliquin has lectured extensively on practical and theoretical aspects of physical conditioning in eight different countries and in 3 different languages.

Charles has also written over 500 articles for various web sites, magazines and journals. His work has been translated in 7 different languages. English, Swedish, German, French, Italian, Dutch and Japanese.

Applied Background:

Charles Poliquin is recognized as one of the world's most successful strength coaches, having coached Olympic medalists in twelve different sports including the US female track and field for the Olympics 2000.

Theoretical Background:

Author
B.Sc. Kinesiology
M.Sc. Exercise Physiology

Books Published:

Modern Trends In Strength Training
Winning the Arms Race
The Poliquin Principles
The German Body Composition
Manly Weight Loss

Multimedia Publications:

Poliquin Power Audio Series

Writer of the foreword on the upcoming UNICEF fundraising recipe book which include recipes of Canada's Olympic athletes like Myriam Bedard, Jean-Luc Brassard.

International lecturer in practical and theoretical aspects of physical preparation (more than 190 conferences since 1985).

For an exclusive seminars, personal phone consultation, and corporate sponsorship, please visit:
http://www.charlespoliquin.net

Individualization of Mass Gaining Programs

Return to T.O.C.

Gaining mass is probably the most predominant goal amongst weight trainees. However, a very small percentage of current trainees are satisfied with their gaining schedule after their first 12 weeks into it.

Why, because pretty much any training system will work for a novice lifter. To keep making gains, one must follow proper training principles. To further add to the problem, there is no single mass gaining training program that works for everybody. However there are training principles that will help you design one that works best for you.

For any given training program, there are four main factors that affect its outcome:

1. The interpretation by its reader on how to apply the program. No two readers will interpret and implement a given set of loading parameters in the same fashion.

2. Not everybody reacts the same way to out-of-the-gym training stressors. One situation can be looked on placidly by one trainer, while another trainer's cortisol levels will shoot up.

3. Genetics. No two trainers are born with the same genetic make-up to respond to a given training program. Even in identical twins, I have seen differences in training responses, this may have to do with the fact that there is one who is always more dominant psychologically.

4. Training age. A program that may be great to get your body weight from 165 lbs to 180 lbs, will be useless to get your from 180 to 190 lb. Trainers who have made significant gains in hypertrophy have one thing in common: they have tried many approaches.

The objective of this chapter is to give you the necessary framework to design an hypertrophy program that works for you. In Part I of this chapter I will outline 21 time and result tested training principles for hypertrophy. Part II will outline sample workout programs that apply those success based principles.

Poliquin´s 21 `Training For Mass´ Principles

Return to T.O.C.

Principle 1

Exercise technique is of paramount importance.

Knowing the best exercise technique for each lift is more important than any loading parameter, dietary regime, supplement, or psychological technique. Whether you have a perfect diet, get quality sleep and have a great routine, if you don't know how to lift properly you are opening yourself to plenty of wasted efforts and frustration. My clients have often reported to me, that tips on how to lift that I have taught them have had the greatest positive influence on their progress curve. If you don't know how to lift, don't waste time, get help from a qualified professional. Without a shadow of a doubt, non-gainers have horrendous lifting technique.

How many trainees do you know who are limited in their exercise selection because of training injuries?

By the way, rep tempo and exercise are not synonymous. Poor mechanics at a controlled tempo is still poor technique.

Regarding technique, squats, deadlifts and pulls are the one that require the most attention. In order to properly learn these, I suggest you contact my associates on my website at www.CharlesPoliquin.net

Principle 2

Never train more than two days in a row.

People who want to gain large amounts of muscle mass should never train more than two days in a row. Olympic level throwers have long been proponents of this concept.

Training more frequently tends to lead to overtraining not so much at the level of the muscle cell but at the nervous system level. In other words, it is hard to recruit high threshold motor units training at high intensities for more than two days in arrow.

There are three possible options of split routines to the individuals wanted to gain weight:

Option 1

Three non-consecutive days a week, whole body workouts. Example: Monday, Wednesday, Friday. In this case, I prefer to use two different routines covering all major body parts. This routine is best suited for 20 percent of trainees. The ones with more limited recovery ability, or for individuals with limited time for training like medical school students for instance.

Option 2

Four days a week, split workouts. Example: Monday, Tuesday , Thursday, Friday. In this case, the lower body would be trained Monday and Thursday, while the upper body is trained Tuesday and Friday. This is the option which I would prescribe 60 percent of the time. It is well suited for the individual with average recovery ability.

Leg training is most demanding and should be done first when coming back from the weekend recovery period.

Like option 1, it also offers the advantage of leaving the weekends off for rest and relaxation.

Option 3

This option is for the more gifted individual which represents about 20 percent of the population. The drawback is that it demands more time commitment and requires that you most often have to train on weekends. The more gifted individual can experiment with the splits routine provided below:

Split Option 3 A

Day 1: Chest and Back
Day 2: Legs & abs
Day 3; off
Day 4: Shoulder and arms
Day 5; off

Split Option 3 B

Day 1: Back & Triceps
Day 2: upper thighs & abs
Day 3; off
Day 4: Chest & Biceps
Day 5; Shoulder & Calves
Day 6 : Off

Split Option 3 C

Day 1: Hamstrings & Calves
Day 2: Back & Shoulders
Day 3; off
Day 4: Quads & Calves
Day 5; Chest & Arms
Day 6 : off

Split Option 3 D

Day 1: Back & Calves
Day 2: Chest & Forearms
Day 3; Off
Day 4: Posterior Chain & Abs
Day 5: Shoulders and Arms
Day 6: Off
Day 7; Quadriceps and calves
Day 8 : Off

Principle 3

Training frequency is determined by the progress in strength.

There is a lot confusion amongst readers of bodybuilding information on the optimal training frequency. There is only one best frequency: the one that works for you.

Now the question is how does one determines that. Very simple. I call it the 2 percent rule of progress. Unless you are a very advanced lifter i.e. 2.2 times body weight in the bench press, You should be able to put either 2 percent more weight on the bar, or do an extra rep, every time you repeat

a workout. Of course, you should always compare set 1 of a given exercise, with set 1 of the same exercise the following workout, and of course set 2 is compared with set 2, and so on. If you are meeting that target strength increase, this is the right frequency for you.

If you are not meeting that target gain, you are either under recovering or waiting too long between workouts. Try at first increasing the number of days between workouts. If this fails, reduce the number of days between workouts AND the number of sets for that workout, which would make you an option 1 type of person.

As a rule of thumb, you have been training correctly for about 7 years, then the 2 percent rule has evolved to the 1 percent rule. In that case, Principle 4 becomes even more important.

In a nutshell, my philosophy on training frequency is rather simple: Train hard, come back once you can lift more. In other words, wait for supercompensation to take place. So training frequency per muscle group is once every 3 to 10 days per lifts.

Powerlifting champion Fred Hatfield is a strong proponent of this system. So was Mike MacDonald, one of the most successful bench pressers of all time. Terry Todd related to me that he would test how he felt in the bench press muscles with just using a broomstick for resistance. If it felt odd he would take an extra day off, or whatever how many days offs he felt it would take to be stronger than the last workout.

The programs outlined in Part II illustrate different types of frequencies, keep in mind that these frequencies are not set in stone. Pay attention to symptoms of impending overtraining like a sudden drop in morning bodyweight and adjust not only the frequency buy the overall volume in terms of numbers of sets and number of exercises.

Principle 4

A variety of loading parameters is critical to achieve mass gains.

Variety in the range of loading parameters is more important when trying to muscle mass than when trying to increase relative strength. While a relative strength athlete needs to sets of 1-5 reps in order to gain strength without increasing mass, the person who desires muscle mass increases

requires reps falling between 6 to 20. By the same token, when you seek muscle mass increases you want to do a greater number of exercises for that body part in order to tap in a wider range of motor units.

Keep in mind that variety of loading parameters is not synonymous with "the Joe Weider instinctive training principle" or the train-as-your-mood-goes method. There has to be consistency and planned structure to succeed in your bodybuilding program. Variety is useful only in a planned manner.

Principle 5

A program is only as good as the time it takes to adapt to it.

To insure rapid gains in muscle mass, make sure to change all loading parameters (reps, sets, speed of contraction, rest intervals, choice and order of exercise) of your training program every three weeks or so.

From experience, I would say that most individuals left on their won will adapt to a training after about 6 exposures to it. When under the supervision of an experienced strength coach who can pick the right loads, this value drops to only 4 workouts.

The more gifted the trainee, or the greater the level of his/her strength, the more often the program needs to be changed. Athletes in sports that need to develop extreme levels of short-term power like throwers and bobsledders are in the extreme range for variety implementation.

Principle 6

Alternate between volume and intensity as training stressors.

For most individuals, I find that alternating every 3 weeks cycles of high volume (accumulation phase) with 3 week cycles of high intensity. (intensification phase) works best . This type of training has had great success with my athletes. On average 16 to 18 lb. of lean body weight are gained over a 12 week period. Samples routines are provided in Part II of this chapter.

During an accumulation phase, for most individuals the loading parameters should look like this:

Loading Parameters: Accumulation			
Total sets/bodypart	6-8	Sets/Exercise	3-4
No. exercises/bodypart	2-3	Rest intervals	60-90 seconds
Time under tension/set	40-60 seconds	Reps:	8-20

During an intensification phase, for most individuals the loading parameters should look like this:

Loading Parameters: Intensification			
Total sets/bodypart	8-10	Sets/Exercise	4-5
No. exercises/bodypart	1-2	Rest intervals	3-4 minutes
Time under tension/set	30-40 seconds	Reps:	5-8

I suggest you start off with a 3 weeks accumulation alternated with 3 weeks of intensification to get a base level concept. That usually for about 70percent of trainees. After this, I suggest you experiment with the right ratio of volume and intensity that works for you.

You may find that 2 weeks of accumulation alternated with 3 weeks of intensification works best for you because your tolerance for volume is limited. On the other hand, your cousin may find that 3 weeks of accumulation alternated with 2 weeks of intensification works best for him. There is no best ratio, only the one that works best for you. The 2 percent rule as explained in principle 3 will help you determine how long you should stay on a particular program.

Principle 7

If you're in the gym longer than one hour, you are making friends - not training.

Keep your workouts short and challenging. Once your warm up is completed, you should not be in the gym longer than an hour. If you are in there longer than an hour, you are making friends, your are not training.

Workouts exceeding the one hour mark have been shown to be associated with rapidly decreasing androgen levels. This shift in androgens negatively influences the testosterone-cortisol ratio. Since this value is very strongly

correlated to strength gains (r=0.86), one may infer that training under depressed androgen levels is counter-productive, since the catabolic effects of the glucocorticoids would negate the anabolic effects of the androgens. Apparently an hour pause is sufficient to allow the testosterone levels to normal. This is why modern strength training has evolved to multiple daily sessions from the traditional two-hour workouts.

Principle 8

In accumulation phases, load the muscles for at least 40 seconds per set.

To gain size the muscles need to be loaded long enough. Of course, there are genetic freaks who can gain with sets of only 5 to 10 seconds duration, but they are the exception not the rule, and they don't even need to read this chapter anyway. Powerlifting champion Roger Estep comes to mind in this matter, he had a better physique than most Mr. America contestants, yet his preferred rep/set scheme was multiple sets of one rep.

So for example, lets say you take 5 seconds to complete the eccentric portion of the lift, and 1 second to complete the concentric range, your repetition cycle is of 6 seconds on average, therefore you want to do minimum of 7 reps per set if you are following that tempo prescription.

When people fail to make gains, it is often because they rush through sets. If one were to ask me what is the ideal time under tension to gain size, I would say 40 seconds, this will work in about 60 percent of individuals. For individuals with high fast-twitch make-up, this value is around 20 to 30 seconds. On the other hand, about 20 percent of individuals get better hypertrophy response from doing sets in the range of 60 to 70 seconds per set.

Principle 9

In intensification phases, load the muscles for at least 20 seconds per set.

In this phase, your goal is tap in higher threshold motor units, therefore you will be using greater loads for fewer reps. So for example, lets say in the bench press, you are taking 2 to complete the eccentric portion, taking a 2 second pause in the bottom position of the lift, and 1 second to complete the concentric range, your repetition cycle is of 5 seconds on average, therefore you want to do minimum of 4 reps per set if you are following

that tempo prescription.

In intensification phases, pausing between reps permits greater motor unit activation, thus the handling of greater loads. A pause as short as 2 seconds in the favorable angle of the range of motion is sufficient to greatly enhance activation of the muscle's motor unit pool.

Principle 10

For greater workout efficiency, make antagonistic pairs contract alternately.

Regardless whether you are in an accumulation phase or an intensification phase, you will be able to recruit more motor units if antagonist pair contract alternately (e.g. flexion followed by extension). as opposed to agonist contractions alone (pre-contraction of antagonists).

The ability of achieving full motor unit activation (MUA) in a muscle contraction may be enhanced when immediately preceded by a contraction of the antagonists. This has the added benefit of allowing to double the workload per training unit. Alternate exercises working agonists muscles with exercises working antagonistic muscles together, while respecting long rest intervals.

For example, after doing a 6 R.M. set of incline barbell press for the chest, rest 100 to 120 seconds, then perform a heavy set for the antagonist muscle i.e. 6 R.M. set of weighted pull-ups for the upper back, rest another 100 to 120 seconds and repeat the described-above procedure for the required number of sets.

Principle 11

Choose exercises who give you the most bang for your buck.

Quadriceps

Back squats, front squats, cyclist squats, barbell hack squats, Trap Bar Deadlifts, backwards sled dragging, all forms of lunges/split squats.

Posterior chain

Snatch deadlifts on podium, standing bent-knee good mornings, Romanian deadlifts, All forms of Olympic pulls, All forms of deadlifts: barbell, dumbbell, Trap Bar…

Upper Back

All forms of pull-ups and chin-ups All forms of rows: barbell, dumbbell and most machines

Chest

All forms of barbell and dumbbell presses, whether they are incline, decline or flat. All forms of dips.

Traps

All forms of shrugs, Olympic pulls, power cleans and power snatches.

Elbow flexors

All forms on incline and Scott curls. No the standing barbell curl is not one of them according to both MRI and EMG studies

Triceps

All forms of presses and free weight triceps extensions, particularly in the decline position.

This is not to say that isolation type exercises are never used in weight gaining regimens. For mass building purposes, they are best used in pre-exhaustion or post-exhaustion training schemes.

Now if one looks at the exercises given, no need for a fancy gym. It is quite possible to develop a large and muscular physique using basic home gym equipment. Or just look at some the physiques built at the Club Fed gyms…

Also keep in mind that many commercial gyms are now devoid of the most basic mass and strength building tool: the Power Rack.

Plus training at home will allow you to use some result producing tools

such as the Trap Bar, the cambered, thick dumbbells and barbells. The greatest advantage of home gym training is that you are in total control of your training.

Principle 12

Strive to be strong at all angles.

One mistake I often see when applying the most bang for your exercise principle is that people only do the ones where they can use the highest loads. For example, they will do back squats but won't do front squats, they will do close parallel chin-ups but not subscapularis pull-ups and so on…

They are the same of individuals that will only incline barbell press if the bench angle is set at 45 degree or less, for fear of not appearing strong to their fellow lifters. So what, if your bench is set 62 degrees, it is the recruitment of new motor units that counts. If you understand the concept of structural balance, you will not be afraid to train lifts which you are poor at. Take the example of Ed Coan who had made an impressive jump in his bench press performance. When asked what he attributed it to, he replied that he had brought up his press behind neck.

Besides gaining muscle mass faster while using this principle, you will also remain injury free as your strength levels will be balanced. Overuse of certain exercises leads to pathologies similar to repetitive pattern conditions like carpal tunnel syndrome.

Principle 13

Dumbbell work is the foundation of strength.

Staying away from dumbbell work is another training mistake. One man who knew how critical dumbbell work was the legendary Pat Casey, the man officially credited for being the first bench press of 600 lb. Plenty of heavy dumbbell incline presses was done before he reached that landmark weight in the bench press.

Besides exercising the muscles for greater ranges, dumbbell work requires stabilization of the joint which makes succeeding barbell work much easier. Of course, for practical and physiological reasons, this principle applies more to the training of the upper extremities.

To further elicit more motor units, I strongly suggest that you get into thick handle dumbbells like the ones sold on GraceFitness.com

One of the best compliments I had for my Arizona training facility came from strength legend Bill Kazmaier who came in my facility to get a shoulder treatment. He came early for his appointment so he asked if he could get in a quick workout. Once he saw my thick handle dumbbells, his eyes lit up like a four year old kid on Christmas morning. After his workout, we had a quite a chat on the role of thick handles in developing strength and mass.

Principle 14

Strive to increase your poundages for reps.

Be aware that before bodybuilders became walking pharmacies, in the days of Reg Park and Bill Pearl, they were strong. Reg Park was known to press behind neck over 300 lb. for reps. In those days, gyms were not so abundant and the Iron Game participants: weightlifters, bodybuilders and powerlifters all trained together, so there was pressure for bodybuilders that have muscles to could produce strength.

They knew that muscles that were going to lift big loads for reps were going to be larger muscles. For some odd reason, this very simple rule has been forgotten.

Since the product time under tension and load used is the critical factor to elicit hypertrophy gains, a very simple way to insure results is to project goals. For example if your best performance is 225 lb. for 6 reps in the back squat, you may want to assign yourself the goal of doing 265 lb. for 6 reps in 12 weeks from now. You can be sure that by that time your thighs will be significantly larger.

If you were to use single rep performance for your goal, you may achieve it, but you may not be necessarily larger.

Powerlifters and Olympic lifters often put 40 to 50 lb. to their lifts without gaining a significant amount of weight, but if they were to get the same poundage increase for their best 6 reps performance, you can be sure they would be competing in the next weight class up.

A basic rule of thumb that you should keep in mind: a weight increase for reps for a major lift by 10 pounds translates into a gain of 1 pound of lean tissue. In other words, increase your lifts for 6 reps by 50 lbs, you will gained 5 lbs of muscle mass.

Principle 15

Coax, not force, your muscles to adapt to greater loads.

Physically and psychologically, it's easier to increase the amount of weight you can lift if you go up in small increments. Unfortunately, the smallest plate available in most gyms is two and a half pounds, so the smallest weight increment on a barbell is five pounds. That's usually the smallest increment on dumbbells as well, so it's actually ten pounds when you're using them in pairs. You can easily see how a five-pound increase is too big a jump if you're using, say, a single 20 pound dumbbell to work the rotator cuff muscles of the shoulder. It's a 25 percent increase in the load. It would be like trying to jump straight to 500 pounds on a lift where you can do 400.

The best way to coax your muscles into adaptation is through application of the Kaizen Principle. In Japanese, "Kaizen" means "constant and never-ending improvement." It is a philosophy that small, incremental improvements made consistently will, over the long term, produce large gains. There are several ways to increase the weight in small increments:

1. PlateMates
2. Small discs
3. Combinations of pound and kilogram plates
4. Assorted weight collars

The easiest way to apply the Kaizen principle for dumbbells is to use PlateMates, magnetic add-on weights sold by Benoit Built, Inc. The principal advantage of PlateMates is that they attach easily to dumbbells as well as to barbells. An additional benefit is that they can be used to correct inaccuracies in low-quality dumbbells and plates. For example, if you have a dumbbell that is nominally 25 pounds but actually weighs around 24, you can add on a PlateMate to bring it closer to standard. Discrepancies between dumbbells or plates might not seem like such a big deal. In fact, though, awareness of such discrepancies can cause fear of injury—fear that may actually manifest itself in an injury if it disrupts concentration when you lift.

PlateMates are available in 2 1/2, 1 1/4, and 5/8 pound sizes in two shapes: donut and hexagon. I recommend the donut-shaped weights, since they fit both circular and hexagonal dumbbells. To order PlateMates, call 1-888-79-SPRAY.

Another approach to increasing the weight in small increments is to use Eleiko Olympic small discs of 0.5 and 0.25 kilograms. They fit on Olympic-size bars and dumbbells. You can order them from Dynamic Fitness by calling 1-734-425-2862. For Imperial system weights (pounds), you can purchase them by calling 1-800-759-6399 or 1-925-253-0323 or by going on-line at www.ivanko.com.

You can also use combinations of kilogram and pound plates along with the EZ bar solid collars. For example, 1.25- and 2.5-kilogram plates weigh 2.75 and 5.5 pounds respectively. An EZ bar collar weighs about 1.5 pounds. If the base weight on the bar is 225 and your personal best for one rep is 240, you could apply the Kaizen principle to increase the weight in the following manner:

225 + 2(5) + 2(2.5) = 240.0
225 + 2(5) + 2(2.75) = 240.5
225 + 2(5.5) + 2(2.5) = 241.0
225 + 2(5.5) + 2(2.75) = 241.5
225 + 2(5) + 2(2.5) + 2(1.5) = 243.0
225 + 2(5) + 2(2.75) + 2(1.5) = 243.5
225 + 2(5.5) + 2(2.5) + 2(1.5) = 244.0

Finally, you can use collars of various weights. Former Olympic thrower Bruno Pauletto's company, Power Systems, sells assorted collars. The Olympic Okie Grip Collars weigh 2 pounds each, the Olympic Metal Quicklee Collars weigh 1 pound each, and the Olympic Muscle Clamps weigh 0.5 pounds each. Combinations of these collars allow you to increase the weight by 1, 2, 3, or 4 pounds at a time. I particularly like the Okie grips if I am going to work with my customized, thick-grip Olympic bar. The rubber inner lining of the Okie grips prevents slipping of the plates.. I bought my first pair in 1986, and they still hold tightly on the bar, even with very heavy loads. These collars can be purchased by phone at 1-800-321-6975 or by fax at 1-800-298-2057.

Principle 16

Be quiet in the gym.

No talking in the gym. Your proverbial non-gainer is often the guy that yaks away in the gym. Talking between sets about irrelevant topics takes away from the focus needed to use optimal loads for the prescribed number of reps.

In fact, I think they should make legal to roundhouse kick in the face with a pair steel-toe boots anyone you who uses a cell phone in the gym. The only talking permitted would be training related: pushing your partner, telling him or her how much weight you want on the bar. Training has to be conducted in a business-like manner if you are serious about making gains. Concentration on every rep and every set is the key to effort and results. This is why there are no mirrors and music in my Performance Center, the rule is simple; go heavy or go home. There are also no chairs to sit on to drink your post-workout. Lounging around will destroy a great atmosphere. Once their workout is done, we give them their post-workouts in a bottle to drink on their way home.

Principle 17

Keep accurate records of your training poundages.

Keep a detailed log book of your training program. According to Tommy Kono, the Michael Jordan of the sport of weightlifting, there is no single better training aid. In his words: "the palest ink is better than the best of memories". A well kept training journal will allow you to monitor and evaluate the efficacy of your training program and help to set short-term goals.

I once was asked by an intern trainer to go over his training log to help him design better training programs for himself. I would see things like 100 lbs done for 5.3 reps. I asked him how can you do 5.3 reps. He replied well I did 5 reps complete reps, then I did only a third of the rep…I then asked with a serious look on my face "How can you be sure it was not 5.32 or 5.38 reps?".

I could instantly read the anxiety in his eyes indicating a nine-fold increase of cortisol from the perceived screw-up. In my usual diplomatic style, I con-

tinued "You are pregnant or you are not. There is no in-between. Next time, record just 5 reps please." The poor guy was probably producing more cortisol wondering if he had done 5.2 or 5.3 reps.

Needless to say, once I related the story to my hockey star client Al MacInnis, he promptly assigned the intern the nickname "5.2", which stuck on to this day.

When using the training diary as a tool, make sure that training conditions were the same. For example, rushing through a workout shortens the rest intervals, and thus makes a comparison with a normal workout difficult.

The training diary helps me tremendously as a strength coach on deciding how to orientate the training from phase to phase for every single client. At my training facility our training diaries are computerized so that we have ongoing statistical analyses of the training progress and effectiveness. This methodological log keeping, with the help of a brilliant , mathematician has helped me developed structural balance norms and optimal and precise volume and intensity prescriptions for specific lifts.

Principle 18

The most demanding neural work should be done first.

In plain English, this implies that low rep work and/or high velocity work should be done first in the workout. So for example, if you are going to work both in the 6-8 rep range and in the 15-20 rep range, then the sets of 6-8 rep should be done first, then the 15-20 reps are done after. If you do the reverse both your total tonnage and average weight lifted will be lower, thus leading to suboptimal gains.

In regards to high velocity work, it would mean for example that power cleans would be done before squats, as acceleration is critical in the performance of a power clean. Relatively speaking, the nervous system has to be more fresh to do a great series of power cleans than to do a great series of squats.

Principle 19

The number of sets per exercise is inversely proportionate to the training frequency for that body part.

From experience, I have found that people who grow best on only 2 sets of 8-12 reps a body part, react better when they train that muscle 3 times weekly. Conversely, the gifted ones, who put size on by doing 5 sets of 4-7 reps/2 exercises per body part react best to a training frequency of 5-7 days for that body part.

You can find the same analogy of how people learn new educational material. To pass a kinesiology exam where you need to know all the muscles with their attachments, nerve supplies, and movement patterns, some people may need to read the same chapter 3 times before moving on to the next one. Some individuals will do better by learning from 5 books different from the class manual, and others will read half the class manual at one sitting, remember it all, wait a month to finish the book and pass with flying colors.

Principle 20

Tolerance to training volume can be increased by proper nutrition.

The dietary principles and recommendations outlined by co-author Will Brink will effectively allow you to recover more quickly. I have often seen individual hard gainers turn into easy gainers once their diets were fixed.

By improving their nutritional status, they could handle greater training loads leading to faster and greater gains in mass and strength. A simple mineral deficiency can ruin havoc on your work capacity, that is the ability to repeat sets without dramatic drop-offs in performance levels.

Principle 21

Cut back on the other training.

Technical training and energy system training should be put on a maintenance mode if done at all when training for added hypertrophy. Most coaches are probably having an anxiety attack reading these lines. However, my experience and the feedback from top-level coaches in alpine skiing, diving, figure skating, gymnastics and volleyball, support the fact that athletes perform their skills at a higher level when they return to them after a concentrated twelve week strength training block. Of course, a very brief period of adaptation (two-three weeks) is needed to reeducate the central nervous system in how to use that newly built body.

If you are training to gain lean tissue, you should stay away from aerobic work, particularly the slow rhythmic type. This type of work is associated with catabolic hormones which will break down your muscle mass, and make your training effort in the gym wasted.

Be aware that if you are engaging in other physical activities like lets say tae-kwon-do classes, it will be hard to gain lean tissue. I would suggest you cut back on other activities until you gain the desired weight.

FREQUENTLY ASKED QUESTIONS REPORT

Click Here

While you may be familiar with many of the terms and descriptions used in this section you may find you need to refer to the **Poliquin Frequently Asked Questions Report** found at the end of this section or by clicking on the link above.

Introduction To Sample Training Programs

Return to T.O.C.

IMPORTANT: READ FIRST

It's extremely important that you thoroughly read the "Poliquin's 21 Training For Mass Principles" before you embark on any of the training routines listed in the next section, otherwise you will not be familiar with many of the terms and principles (such as why each routine has an 'accumulation' and an 'intensification' version etc).

If you're relatively new to Charles' methods, you should also read the report at the end of this chapter entitled "Poliquin FAQs" (Frequently Asked Questions). Also, for those of you unfamiliar with exercises that fall out of the 'bench press', 'dumbbell curl' variety, please refer to the second report, "Exercise Descriptions", which can also be found following this section.

In this section you will find a number of training routines designed for individuals with different tolerance levels that are based on the number of days you can allocate to your training. Each of the workouts includes both an intensification and an accumulation version.

There are three options:

- Option 1 for 'high frequency, low volume responding individuals.
- Option 2 for 'average recovery individuals.
- Option 3 for 'gifted individuals.

You should choose the routine that best suits your recovery and tolerance levels as well as how many times per week you can visit the gym. Option 2, is the most widely chosen routine and suits around 80% of the population.

Note: rest between sets is indicated in seconds

Sample Training Programs

Return to T.O.C.

3-Days per Week Accumulation Workouts

Option 1: For high frequency-low volume responding individuals

This option consists of three days/week, whole body workouts. It's very productive for about 20% of the population. It's also ideal for individuals who have very limited time.

Option 1 - Accumulation: Monday & Friday					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Back Squats	2	15-20	2010	90 s
A-2	Lying leg curls feet inward	2	6-8	4010	75 s
B-1	Parallel Bar Dips	2	10-12	3010	75 s
B-2	Close Parallel Grip Chin-ups	2	8-10	4010	75 s
C-1	Incline Dumbbell Presses	2	10-12	3010	75 s
C-2	Seated Cable Rowing	2	8-10	4010	75 s
D-1	Decline Triceps EZ Bar Extensions	2	10-12	3110	75 s
D-2	Incline Dumbbell Curls	2	8-10	4010	75 s
E-1	Standing Calf Raises	2	10-12	2210	60 s
E-2	Low Cable Pull-Ins	2	10-12	2020	60 s

Option 1 - Accumulation: Wednesday					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Back Barbell Lunges	2	15-20	2010	90 s
A-2	Dumbbell Deadlifts	2	12-15	3010	75 s
B-1	Back Step-ups	2	15-20	1010	75 s
B-2	Back Extensions	2	12-15	2012	75 s
C-1	Incline Dumbbell Presses	2	10-12	3010	75 s
C-2	Supinated Chin - Ups	2	8-10	4010	75 s
D-1	Decline Dumbbell Presses	2	10-12	3010	75 s
D-2	One Arm Dumbbell Presses	2	10-12	3010	75 s
E-1	Seated Raises	2	15-20	2010	60 s
E-2	Twisted Crunches on Swiss Ball	2	10-12	2020	60 s

To download a pre-printed workout chart:

Click Here

3-Days per Week Intensification Workouts

Option 1: For high frequency-low volume responding individuals

Option 1 - Intensification: Monday & Friday					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Front Squats	3	4-6	5010	120 s
A-2	Lying Leg Curls - Feet Outward	3	4-6	5010	120 s
B-1	Cambered Bar Bench Presses	3	6-8	4010	90 s
B-2	Lean-Away Chin-Ups	3	6-8	4010	90 s
C-1	Seated Dumbbell Presses	3	6-8	4010	90 s
C-2	Incline Hammer Curls	3	6-8	4010	90 s
D-1	One Leg Calf Raises	2	8-10	2110	70 s
D-2	Twisting Garhammer Raises	2	10-12	2010	60 s

Option 1 - Intensification: Wednesday					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A	Bent-Knee Barbell Deadlifts	4	8,6,4,4	4010	180 s
B	Half-Deadlifts in Rack + Shrugs	3	6-8	2110	180 s
C-1	Decline Barbell Presses	3	6-8	3110	90 s
C-2	Subscapularis Pull-ups	3	6-8	4010	90 s
D-1	Standing Pause EZ-Bar Reverse Curls	3	6-8	2110	90 s
D-2	Twisting Garhammer Raises	2	10-12	2010	60 s

To download a pre-printed workout chart:

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4-Days per Week Accumulation Workouts

Option 2: For average recovery individuals

The 'Option 2' programs consist of a four days a week, split type workout. It is very productive for about 60% of the population. It also offers the advantage of having the weekend off. Some individuals would prefer to do some of these workouts of the weekend. The basic rule is two days on/one day off, two days on/two days off. For illustration sake, we will use the Monday-Thursday and Tuesday-Friday approach.

Option 2 - Accumulation: Monday & Thursday					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Cyclists Back Squats	4	10,12,15,20	2010	90 s
A-2	Lying leg Curls feet inward	4	6-8	40x0	75 s
B-1	Lunges	4	10,12,15,20	20x0	90 s
B-2	Romanian Deadlifts	4	10-12	4020	75 s
C-1	Standing Calf Raises	3	12,15,20	1110	60 s
C-2	Low Cable Pull-Ins	2	10-12	2020	60 s

Option 2 - Accumulation: Tuesday & Friday					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Incline Dumbbell Presses	4	8,10,12,15	3010	75 s
A-2	Close Parallel Grips Chin Ups	4	8-10	4010	75 s
B-1	Decline Dumbbell Presses	3	10-12	3010	75 s
B-2	One Arm Dumbbell Presses	3	10-12	3010	75 s
C-1	Decline Dumbbell Triceps Extension	3	10-12	3110	75 s
C-2	Seated Off-set Dumbbell Curls	3	8-10	3010	75 s

To download a pre-printed workout chart:

Click Here

4-Days per Week Intensification Workouts

Option 2: For average recovery individuals

Option 2 - Intensification: Monday & Thursday					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Front Squats	5	4-6	50x0	120 s
A-2	One & 1/4 Lying Leg Curls Feet Out	5	4-6	50x0	100 s
B-1	Bulgarian Split Squats	4	5-7	30x0	100 s
B-2	Standing Good Mornings	4	6-8	3020	100 s
C-1	Seated Calf Presses	5	8-10	2210	75 s
C-2	Twisted Low Cable Pull-Ins	5	8-10	2010	75 s

Option 2 - Intensification: Tuesday & Friday					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Top Half Range Incline Presses in Rack	5	4-6	2210	100 s
A-2	Subscapularis Pull-ups	5	4-6	5010	100 s
B-1	Incline Barbell Presses	5	4-6	5010	100 s
B-2	Bent Over EZ Bar Rows	5	4-6	5010	100 s
C-1	Seated Parallel Grip French Presses	3	7-9	3110	90 s
C-2	Scott close-grip EZ bar Curls	3	7-9	5010	90 s

To download a pre-printed workout chart:

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3 Days Out of 5 - Accumulation Workouts

Option 3: For gifted individuals

There are many split routine options for these individuals, as their recovery ability is superior. However, in most cases, I recommend a three days out five training split, where each body part is trained thoroughly once every five days. The only disadvantage with the 3 days out of 5 split is that most often you do have to train at least one day per weekend. But when you are serious about your training this is not too much of a constraint.

For illustration sake, i will detail the following training split:

Day 1: Chest, Back & Shoulders
Day 2: Thighs, Calves
Day 3: off
Day 4: Arms & Forearms
Day 5: off

As you will have noticed, there is no direct abdominal work in this phase. I often eliminate or reduce drastically one bodypart's volume per phase, as this allows for greater concentration on chosen bodyparts and permits recovery for some. For example, if one wants big arms, a key to reaching that

goal is to do NO DIRECT WORK on them, three months in a row out of every year. In this case, the split would look like this:

Day 1: Chest, Back
Day 2: Thighs, Calves
Day 3: off
Day 4: Shoulders & Abs
Day 5: off

Option 3 - Accumulation: 3 Days Out of 5 - Day 1					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	25 Degree Incline Dumbbell Presses	4	6,8,10,12	2210	100 s
A-2	Lean - Away Parallel Grip Chin Ups	4	7-9	5010	100 s
B-1	Flat Dumbbell Presses	3	10-12	3010	10 s*
B-2	Incline Cable Flyes	3	10-12	5010	100 s
B-3	Seated Cable Rowing to Neck	3	8-10	3110	90 s
B-4	Decline Barbell Pullovers	3	15-20	2010	90 s
C-1	Rope Cable Upright Rows	3	12-15	3010	75 s
C-2	Seated Dumbbell Presses	3	8-10	2012	10 s*

* This is not a typo: it's TEN seconds!

Option 3 - Accumulation: 3 Days Out of 5 - Day 2					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Cyclists Back Squats	4	10,12,15,20	2210	100 s
A-2	Leverage Leg Presses	4	4-6	5010	100 s
B-1	Lying Leg Curls Feet Inward	3	4-6	5010	100 s
B-2	Romanian Deadlifts	3	4-6	5010	100 s
C-1	Standing Calf Raises	3	7-9	3110	90 s
C-2	Seated Calf Raises	3	7-9	5010	90 s

Option 3 - Accumulation: 3 Days Out of 5 - Day 4					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	10 Degree Decline Close Grip Bench Presses	4	6,8,10,12	3210	75 s
A-2	Seated Zottmann Curls	4	6,8,10,12	3210	75 s
B-1	Rope French Press	3	10-12	3110	10 s*
B-2	Pronated Tricep Pressdowns	3	15-20	3010	90 s
B-3	Scott Gorilla Bar Reverse Curls	3	7-9	4010	10 s*
B-4	Low Rope Supinating Curls	3	12-15	3010	90 s
C-1	Decline Pronated Wrist Curls	3	12-15	2010	60 s
C-2	Gripping Machine	3	15-20	2010	60 s

* This is not a typo: it's TEN seconds!

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3 Days Out of 5 - Intensification Workouts

Option 3: For gifted individuals

Option 3 - Intensification: 3 Days Out of 5 - Day 1					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Barbell Bench Press	6	8,6,4,4,6,8	3110	100 s
A-2	Medium Parallel Grip Chin Ups	6	8,6,4,4,6,8	3110	100 s
B-1	60 Degree Incline Dumbbell Press	4	8-10	3010	90 s
B-2	One Arm Arc Dumbbell Rowing	4	8-10	3010	90 s

Option 3 - Intensification: 3 Days Out of 5 - Day 2					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Front Squats	6	6,4,4,4,4,6	5010	100 s
A-2	One & One Quarter Lying Leg Curl	6	6,4,4,4,4,6	5010	100 s
B-1	Back Lunges	4	6-8	30x0	90 s
B-2	Seated Good Mornings	4	7-9	3020	90 s
C-1	One Leg Calf Raises	3	8-12	1210	75 s
C-2	Tibialis	3	8-12	2010	75 s

Option 3 - Intensification: 3 Days Out of 5 - Day 4					
Group	**Exercise**	**Sets**	**Reps**	**Tempo**	**Rest**
A-1	Close grip bench presses with chains	5	8,6,4,4,4	40x0	100 s
A-2	Seated Close Grip Scott Curls	5	8,6,4,4,4	40x0	100 s
B-1	Incline Barbell Tricep Extension	5	6,6,6,8,10	2210	100 s
B-2	Incline Hammer Curls	5	6,6,6,8,10	4010	100 s
C-1	Low Pulley Pronated Wrist Curls	3	10-12	2010	75 s
C-2	Low Pulley Supinated Wrist Curls	3	10-12	2010	75 s

To download a pre-printed workout chart:

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Are You Delusional About Your Fiber Makeup?

Return to T.O.C.

In the last few years, I have many readers write in claiming that they were fast twitch individuals because they could only limited amount of reps at a percentage of max. For example, at 85 percent of maximum, for most lifts, a typical individual will do 5 R.M., a gifted fast-twitch athlete will do 2 reps. I have seen in twenty-two years only one person who did even less: one rep at 85 percent. He was a running back from the NFL. At a body weight of 190 lbs, he bench pressed 300 lb. his first day training under my guidance. His teammates corroborated the fact that he was not a weight room enthusiast.

However, I doubt very much that there is that many of them running around. Here is why:

1. For the last two decades, I have trained mainly Olympians. Therefore athletes who went through an extensive selection process before I ever got the chance to work with them. One of the factors that made them superior was their superior fiber make-up. Even amongst that select segment of the population, only a small percentage 0.3 percent had scores below 3 reps on the 85 percent of 1 R.M. The athletes who achieved such scores were throwers, American Football wide receivers and running backs, lugers, bobsledders, weightlifters and judokas.

2. I have seen individuals improve the number of reps they can do at a given high percentage of max. (e.g. 85 percent) once they correct a mineral deficiency and/or have gotten rid of high levels of toxic metals such as mercury and lead.

3. Over the last two years, we have measured levels of mercury after injected with the chelating agent D.M.P.S.. The athletes who had high levels of mercury, tended to have a poor ability to repeat at a high percentage of maximum. The number of reps they could do at 85 percent would increase within 8 weeks of following a program to detoxify that toxic metal.

4. If an athlete's meat intake is very low, his ability to do reps at high percentage of maximum is compromised as his creatine intake is low.

5. Also I have seen individuals score poorly on high reps because they lived under the illusion that they were fast-twitch, by manipulating their warm-up and using a combination of kilo and pound plates to prevent assessing the weight on the bar properly by them, testing showed that they were in fact slow-twitch.

6. Outside of very intrusive biopsies, which not that valid anyway, the best tests for fiber make-up are done in biomechanics labs where time to peak force are measured.

7. Individuals who are truly fast-twitch not only well on strength tests but rather distinguish themselves on field power tests like throwing and jumping tests variations, such as the penta-jump and the seated medicine ball throw. The standardized track and field quadrathlon test could give a fair idea of what your fiber make-up test is.

Another way is to test your fiber make-up is to find your 3 R.M. and then wait 5 minutes and test for 1 R.M.. The most I have ever seen someone do on top of their 3 R.M. is 23 percent more. That is the range that top 7 World Class Olympic lifters will do. Yet, I have seen an Olympic Silver medalist in weight lifting only do 10 percent more which is the average score. If you can only do 2 percent more, take up rowing.

Poliquin FAQs by Evan R. Peck, M.D.

Return to T.O.C.

What do those "A-1" and "A-2" designations mean next to exercises?

Exercises with the same letter listed in front of them should be done as a superset. In other words, you alternate between sets of those exercises, rather than doing all the sets of one and then all the sets of the other. The numbers indicate the order in which you should do the exercises. The rest periods between each exercise in the superset are always listed with the particular exercise, and will often vary for each exercise in the superset. Complete all the sets for the "A" exercises before moving on to the "B" exercises, and so on. For example, if the routine indicated (for illustration purposes only):

Group	Exercise	Sets	Reps	Tempo
A-1	Barbell Bench Press	5	6-8	5010
A-2	Chin Ups	5	8-10	4020

You would perform a set of bench presses for the indicated reps, take 90 seconds rest, and perform a set of chin-ups for the indicated reps, take 75 seconds rest, and perform another set of bench presses, then take 90 seconds rest, do another set of chin-ups, and so on until all the sets for both exercises were complete. Then you would move on to the "B" exercises in the same fashion.

Sometimes, you will see an exercise with only a letter in front of it. This indicates it isn't supersetted with anything. In other cases, there may be more than two exercises listed in a letter group. In this case, you would do a set of each exercise, in the order listed, with the rest periods listed, before returning to the first exercise of the group and completing the cycle again.

Supersetting exercises allows you to greatly increase the workload you can perform in a specific time period. Additionally, research has shown that contraction of a muscle facilitates the stronger subsequent contraction of an antagonist muscle group. In most instances, the exercises in a superset of a Poliquin workout work antagonistic muscle groups. For example, you

may see squats paired with leg curls. In this case, contraction of the quads facilitates a stronger subsequent contraction of the hamstrings, while also allowing you to perform more sets of each in a given time period, and with a greater load, than if you had done straight sets.

What are some other examples of superset pairs?

This depends, of course, on what you're trying to accomplish. Poliquin generally uses supersets, as mentioned above, to work antagonist muscle groups and increase total workload. Nearly any chest exercise can be paired with nearly any back exercise. Most deltoid exercises can also be paired with most back exercises. Most quad exercises can be paired with most hamstring exercises. Most biceps/elbow flexor exercises can be paired with most triceps exercises.

Beyond these general groupings, almost any pairing will work as long as it doesn't "interfere" with the other exercise. For example, if you were working chest and hamstrings on the same day, you could certainly pair dumbbell bench presses with lying leg curls. If you worked chest and shoulders on the same day, a pairing of dumbbell bench presses with overhead barbell presses would tend to "interfere" with each other. This is not good or bad, but if you are using the common, "noninterference" type of supersetting, it's probably going to lead to a markedly decreased load on subsequent work sets.

Sometimes, supersets are used with exercises for the same muscle group (intentionally "interfering"). This is common in pre-exhaustion and postexhaustion routines. For example, you may see a tri-set of squats, leg presses, and leg extensions. This is a post-exhaustion arrangement; other muscle groups are fatigued in earlier exercises and progression is made to completely fatigue the quads by the last exercise. The rep ranges are often different for each exercise.

It is worth noting that the bent-knee deadlift is generally put in the category of quad exercises in Poliquin's routines. Stiff-legged deadlifts are put in the category of hamstring exercises. Most "lower back" exercises are included in the group of hamstring exercises. These allocations are neither right nor wrong. They are not written in stone and are certainly open to modification. The exercises chosen in Poliquin's routines are there for specific reasons and you are encouraged to do the routines as listed before toying with creating your own.

What do those "tempo" designations mean?

The tempo refers to time taken to perform each segment of an exercise. Poliquin usually uses four numbers for his tempo designations, for example: 5110. The first number indicates the number of seconds taken for the eccentric ("muscle stretching") portion of the exercise, such as the lowering of the bar in the bench press. The second number indicates the number of seconds of pause at the end of the eccentric contraction. The third number indicates the number of seconds for the concentric ("muscle contracting") portion of the exercise. The fourth number indicates the pause at the end of the concentric contraction.

The number "0" for either of the pauses indicates no pause. An "X" for the concentric contraction means that the contraction should be performed as fast as possible. In many cases, the weight will be too heavy to move very fast. That's okay. It's the intent of moving the weight fast that matters.

For example, if the exercise is chin-ups and you see the tempo designation "42X0," you would take four seconds to lower yourself from the bar to the elbows fully extended position, pause two seconds, explode on the concentric contraction to raise yourself back to the bar as fast as possible, and take no pause at the top before starting the next rep.

How should I warm up?

It is preferable to do multiple sets of low-rep warm-up sets prior to the first exercise for each bodypart. For example, refer to the following routine:

Group	Exercise	Sets	Reps	Tempo
A-1	Front Squats	4	10-12	4010
A-2	Seated Leg Curls	4	6-8	3110

For the sake of illustration, let's say your loads for the first work sets of these two exercises was going to be 300 pounds and 150 pounds, respectively. An appropriate warm-up would be:

Front squats: 135 pounds x 5 reps
Seated leg curls: 70 pounds x 5 reps
Front squats: 185 pounds x 3 reps

Seated leg curls: 90 pounds x 3 reps
Front squats: 225 pounds x 1 rep
Seated leg curls: 110 pounds x 1 rep
Front squats: 275 pounds x 1 rep
Seated leg curls: 130 pounds x 1 rep

Doing multiple sets of low reps is a more effective warm-up because it leads to lower levels of pre-workout fatigue. Additionally, the trainee is able to use multiple loads to "step" up to the workout weight, while still using sufficient reps to increase blood flow to the muscles prior to beginning the work sets. Doing high rep sets before a low-rep workout can cause neuromuscular inhibition and lower loads will have to be used for the workout. Don't take rest periods between your warm-up sets; simply take the time to move from one station to the next.

In general, use more warm-up sets for lower rep workouts. If the work sets are in the 4-6 rep range, you might do 5-6 warm-up sets per exercise. Conversely, if the work sets are in the 12-15 rep range, you may only require 1-2 warm-up sets per exercise.

The general recommendation is to only do warm-up sets for the first exercise for a given body part in a workout. Subsequent exercises for the same bodypart may not need warm-up sets, although doing a single warm-up set for each new exercise would take very little time and may be worth doing in the interest of injury prevention and nervous system "priming" for that exercise.

Should I go to failure on each set?

Poliquin has said that for most routines and in most circumstances, each work set should be taken to momentary concentric failure. This means no isometric or eccentric failure, no forced reps, no partial reps, etc. However, in many of his routines he specifically states to not go to failure. You may have heard of his "German Volume Training" system; this is an example of a routine where going to failure is not recommended. Unless otherwise indicated, assume that each work set should be taken to momentary concentric failure.

Going to failure is a subjective topic. It is probably unwise to make this a gut wrenching, vein-busting degree of failure on every set of every exercise of every workout. A good rule of thumb is to go to "very difficult"

failure only every third workout or so, with more of a "mildly difficult" or "moderately difficult" failure the rest of the time. When you try a workout for the first time, you shouldn't be using weights that take you close to failure. Gradually build up to this level over a couple of workouts when you start a new routine.

This is a variable that can be experimented with and manipulated on an individual basis. Despite what you may have read elsewhere, it is indeed possible to make progress without going to failure. Many powerlifters and Olympic lifters build an enormous amount of muscle mass and strength without ever going to failure. In general, higher volume routines require less "going to failure" and lower volume routines require more of it. Use failure judiciously, as it can lead to overtraining just as well as too high of a volume or frequency of training can.

Which body parts should be worked first in a superset pair/workout/training week?

There is no right or wrong answer. The body parts worked first are worked best. In general, larger body parts are worked earlier and smaller body parts later but this is not etched in stone. Particularly weak body parts should be worked first in a superset pair/workout/training week if they are meant to be prioritized. There is no reason why biceps should always be worked before triceps in a superset or vice verse. Either approach can and should be used depending on the trainee and goals.

How long will these workouts take?

If you follow the routines as listed, and maintain strict adherence to the tempos and rest periods given, virtually all can and should be completed in under an hour from first work set to last work set. Because of supersetting, far more sets can be performed in the hour than in a conventional routine.

How much weight should I use for each set?

Unless otherwise indicated, in general you should use the amount of weight for each exercise that will bring about momentary concentric failure (see other answer addressing going to failure) within the rep range indicated and using the tempo prescribed.

For exercises in which multiple sets of a single rep range are listed, for example 4 sets of 10-12, you will probably have to decrease the load in subsequent sets to maintain that rep range. For ascending reps, for example 5 sets of 6,6,6,8,10, you will assuredly have to decrease the weight for the 8- and 10-rep sets. For descending reps, for example 10,8,6,6,6 (this is quite rare in a Poliquin routine), you will likely increase the weight until at least the third set.

The key is to use a weight for each set that will cause a sufficient degree of fatigue when performed for the number of reps indicated for that particular set. Poliquin tends not to favor load prescriptions in % of 1-rep maximum because muscle fiber type ratios and neuromuscular efficiency, among other factors, vary so greatly between individuals. Let the reps dictate the weight.

Should I train even if I'm sore?

In general, as long as you are making progress from workout to workout, it's okay to perform a workout for a body part, even if you're sore. Poliquin suggests a reduction in volume for that particular workout by 40%, while using the same intensity. Then, gradually increase the volume from workout to workout as your workload capacity increases. As long as you are meeting the 2% rule, it is unlikely that you are overtraining.

How should I modify my training if I'm a cyclist as my primary sport?

As with all sports and activities, cycling creates some muscle imbalances. One function of a weight training program for the cyclists is to overcome these imbalances and thereby increase cycling performance and prevent injury.

Specifically, the hamstrings and gastrocnemius should be emphasized in relation to the quadriceps and soleus. This means more stiff-legged deadlifts than lunges. It also means more standing calf raises than seated calf raises. The quadriceps exercises that are performed should emphasize the vastus medialis ("inner quad") in relation to the vastus lateralis ("outer quad"). The "cyclist squat" is designed specifically for this. In this exercise, you will do a squat to the floor, come up to parallel, go back to the floor, and then go all the way back up to the starting position. This is one rep. This exercise is also known as a 1 1/4 squat.

Another principle to keep in mind is that cycling, in general, is an endurance activity. Your weight training program should therefore probably involve heavier loads, fewer reps per set, more sets, fewer exercises, and longer rest periods than the average strength trainer (i.e., you would perform more "intensification" type workouts).

How should I modify my training if I'm a runner as my primary sport?

Many of the recommendations for the cyclist are also true for runners. In the case of the runner, it is especially important to emphasize work for the hamstrings and the rest of the posterior chain (which also includes the glutes and erector spinae muscle groups) in relation to work for the quads. As a general starting point, the runner should do about 3 sets of hamstring/posterior chain work for every 1 set of quadriceps-dominant work.

Can I incorporate Olympic lifts into my training?

Olympic lifts and their variations are a great training tool. They are technically difficult to learn and should only be attempted if a qualified Olympic lifting coach (or similarly qualified person) can teach them to you. It is important to consider your training goals and whether Olympic lifts are the most useful tools for meeting those goals. If your primary goal is muscle size, as that is the scope of the e-book, explosive and momentum-dependent lifts may not be the most useful choice of exercise. If your training goals include strength and power development, Olympic lift variations (power cleans, snatch pulls) are probably more useful than the Olympic lifts themselves, whose technical aspects and energy expenditure may outweigh their overall training benefit for most people.

Should I take time off after a certain period of time of training?

This depends to a large degree on the individual trainee. You may notice with experience that you can train a certain number of weeks and make progress before you drop off sharply. In this case, you may want to try taking a 5- or 7-day period off after a certain number of workout weeks in which you find you are still making progress. As a rule of thumb, it's probably a good idea for most people to take a week off after 12 straight weeks of training. Most trainees will find that even that interval is too much. Don't

worry about losing strength with time off; in fact, you may find yourself stronger after a layoff.

Is weight training safe for my heart?

There's a misconception among the exercise-ignorant that weight training leads to long-term heart damage. However, there is no evidence that this is true. In fact, weight training has been shown in several studies to improve many cardiac risk parameters.

How do I know if i'm overtrained?

If you do not meet the 2% rule or 1-rep progress rule, you are probably overtraining or undertraining. If you don't know what that rule is, you haven't read the e-book. There are many other factors to consider, including diet, rest,etc., when determining the cause of stagnation or regression in training.

What shoes should I wear when squatting?

The less padding/air in the sole of the shoe, the less energy wasted pushing into that padding/air during exercises like the squat. Thus, more energy can be expended into the ground and against the bar. This is a crudely-stated physics explanation for why you will able to squat and deadlift more weight with flat-soled shoes versus heavily padded/air pocket shoes. This is important if you are concerned with the actual load you lift. It is less important if you are concerned with hypertrophy or strength development. Your muscles will exert force regardless of if it's through your padded soles or against a bar. It could also be argued, however, that the stability of the movement will be changed by having a padded sole and this will change the training effect. For most people whose goal is general fitness, hypertrophy, and strength, the type of shoe is relatively less important in relation to the training effect.

How much cardio can I incorporate into my training?

It depends on your goals. When hypertrophy and strength is the goal, excessive aerobic training will detract from reaching this goal. When fat loss is a goal, aerobic exercise can be a useful, although probably overrated, tool. In general, Poliquin recommends that you do not add any aerobic exercise to his weight training program. If you want to include some cardio for en-

durance/ cardiopulmonary training benefit, but still have a goal of increasing strength and hypertrophy, limit yourself to no more than 1-2 sessions of 20-30 minutes a session per week as a general rule. Understand that doing less than this will help you reach your weight training goals faster.

Can I train twice a day?

Yes, this can be very productive. Your diet and recovery situation (e.g., stress levels, sleep) have to be optimal for this to work for most people. Poliquin's general recommendation is to start with a 50-minute morning workout and a 30- minute evening workout. Gradually progress to a 60-minute morning session and a 50-minute evening session. Every 3rd workout, don't do the evening workout.

After I do three weeks of an accumulation phase workout and three weeks of an intensification phase workout from the e-book, what should I do next?

You could repeat the accumulation phase with modifications. Stick to the guidelines outlined by Poliquin for these workouts. Change the exercises, but use mainly exercises recommended by Poliquin as the most effective exercises for each body part in the e-book. You may make adjustments in workout volume and frequency, as well as the number of weeks to stay on the accumulation phase. You could then return to the intensification phase with modifications.

It's a good idea to not repeat the same program for at least 12 weeks after completing it, and probably longer. The general idea is to alternate periods of higher volume (accumulation phases) with periods of higher intensity (intensification phases). The guidelines for each of these types of phases are given in the e-book. The details have to be modified depending on the trainee. This will come with experience and good record keeping.

Can I train different body parts with different set/ rep schemes?

Yes. Your fiber type makeup and neural drive, among other factors, could very well be variable between muscle groups. It is fine to train accordingly.

Can I play other sports and maintain the same training program?

Yes, to a certain degree. Understand that excessive outside exercise can lead to stagnation in the gym. However, if you are participating in a casual sporting activity 1-2 times a week, this should not hinder your weight training progress as long as you pay attention to post-workout nutrition. In this case, do your weight training earlier in the day and your other sporting activity later.

Exercise Descriptions by Evan R. Peck, M.D.

Return to T.O.C.

A muscle group that functions as a prime mover for the exercise categorizes the following exercises and their descriptions. However, realize that many exercises could be placed in more than one category. The muscle group category that an exercise falls under is only a general guideline.

Quads

Back Squats

Set a barbell in a power or squat rack at roughly shoulder level. Take the bar on your shoulders, across your traps, and step away from the rack. There are variations in the position of the bar on the back, but for bodybuilding purposes, try to keep it fairly high on your traps.

The higher the bar is placed on your back, the more upright you can keep your stance, which leads to more quadriceps recruitment in relation to gluteal or erector spinae recruitment. Take a roughly shoulder width foot stance with toes pointed only slightly outward. Again, there are variations in stance, but for bodybuilding purposes, a relatively narrow- or medium-width stance is generally used. A narrower stance also dictates a more upright posture.

Feel free to modify bar height and/or stance depending on your goals for muscle recruitment.

Prior to descent, bend your knees slightly, tighten your lower abdomen, and contract your glutes. During the descent, flex forward at the hips, but maintain your pelvic position in relation to your spine.

Squat as deeply as possible without exceeding 45-degree trunk flexion relative to vertical (for the "bodybuilding" version of the squat). Again, the upright posture is preferred mainly for bodybuilding purposes and not intended to maximize the weight used for the exercise.

If your flexibility allows it, descend below a parallel-thigh position to where hams and calves are nearly contacting. Do NOT rest or take tension off the musculature at the bottom. Keep your knees an equal distance apart dur-

ing the entire lift.

Prior to ascent, contract your glutes and hold them during the concentric (lifting) portion of the exercise. Stop your knee extension just short of lock-out. When you have ascended to your starting position, this is one rep.

Back Barbell Lunges

Take a barbell across your back in the same position as if you were going to do a back squat. Step backwards with your dominant leg first. Note that back lunges are different than the more familiar lunges wherein you step forward.

The distance that you step backward should be sufficient so that you can maintain a slightly concave back posture, a thigh position parallel to the ground or slightly below parallel, an upright torso, and a leg position with the lead knee directly over the area between the heel and toe.

This is not because of the alleged safety risks of the knee extending over the toe during the exercise; such an assertion is untrue.

Rather, this position promotes the best overall recruitment of leg musculature.

Once in this bottom position, push through the floor with the lead leg to ascend yourself back to the start position. You may wish to do all the reps for your weak leg first (meaning the strong leg moves backward), take a very short (10-15 seconds) rest, and then do all the reps for the other leg.

A more aerobically challenging option is to do all the reps for both legs alternately in one continuous set. Common mistakes with this exercise are not stepping far enough backwards and leaning too far forward. Learn to make a light load feel heavy, not the reverse.

Back Step-ups

Take a barbell across your back in the same position as if you were going to do a back squat. Stand in front of a bench that is roughly knee high. Step backwards and up onto the bench with your weak leg first. Extend and stand on the bench. Step down with the same leg. This is one rep. As with lunges, all the reps for one leg can be done first, followed by a brief pause

and then the reps for the other (stronger) leg. The alternative, again, is to do alternating reps as part of one set.

Front Squats

Set a barbell in a rack as you would for back squats. Take the bar across your clavicles in the catch position of a clean. In other words, your elbows are pointing forward and upward and the bar is sitting on your fingertips on top of your anterior delts and clavicles. If you find this position difficult, you may hold the bar with crossed arms and the bar under your palms.

Once you have mastered the initial position, step away with the bar. Perform a squat in essentially the same fashion as you would for a back squat, as described above. You will find that the movement pattern is somewhat different because of the bar placement, as even more stress is shifted to the quadriceps.

Cyclists Back Squats

These are similar to normal back squats, but are performed with a narrower (4-6 inches between heels) stance and with the heels on a wedged board. This allows for a more upright posture as well as more vastus medialis ("inner" quadriceps muscle) recruitment, which is commonly underdeveloped in weight trainers because of improper (insufficient depth) squatting. This muscle is also commonly underdeveloped in relation to the other quadriceps muscles in athletes from certain sports, including skiing.

Lunges

These are the more familiar form of dynamic lunge in which you step forward, rather than backwards as described above. The same guidelines for form apply. In general, step forward with your weaker leg first.

Bulgarian Split Squats

First, some definitions. The lunges previously described were forms of dynamic lunge, in that a foot was picked up and moved. A static lunge, conversely, is performed without changing the placement of the feet on the ground. One foot is placed ahead of the other, and the concentric and eccentric movements are performed without stepping.

A split squat is the same thing as a static lunge. A Bulgarian split squat is a form of split squat wherein the rear leg is elevated and placed on a bench. For the exercise, you can use a barbell across your back or a pair of dumbbells. Place one foot in front of a bench and the other foot curled behind you, with the dorsal ("top") surface of the foot face down onto the bench. Ensure that the lead foot is far enough forward so that during the descent, you are able to maintain an upright torso, sufficient stretch in the rear leg, and proper knee alignment in the lead leg, all as similar to that described above in the back lunge. Because of the nature of the exercise, it's probably best to do all the reps for each leg separately rather than alternately.

Leverage Leg Presses

This is a specific leg press machine. It's a seated, 45-degree incline seated leg press, but instead of the weight platform moving in its normal, linear fashion, it rotates about an arc. If this machine is unavailable to you, just use a normal, 45-degree incline seated leg press. Sit in the machine; place your feet on the weight platform in a shoulder-width stance with the feet slightly rotated outward. Take away the safety supports and lower your knees to your chest. Do not take the tension off the your muscles at the bottom. Extend your knees and push the platform so that your knees are just short of lockout. Again, do not take tension off the musculature.

Hamstrings/Posterior Chain

Bent-knee Barbell Deadlifts

Start with a shoulder width stance, squatting down grasping a bar resting on the ground. Use a pronated (palms down) grip with wrist straps or a mixed grip (one hand pronated and the other supinated or palm up). Powerlifters must use the mixed grip in competition; however, this grip is associated with biceps tears if done improperly. For most non-powerlifters, most of the time, who are using the deadlift for bodybuilding or general strength training purposes, the pronated grip with straps is probably best. The bar should be as close to your shins as possible. Your shoulders should be vertically over the bar. Your butt should be down. Keep your lumbar spine flat or even slightly concave. Your scapulae (shoulder blades) should be retracted and depressed (brought together and lowered) in the start position. Initiate the movement by extending your legs, contracting your abs and glutes to maintain pelvic and spinal alignment, and maintaining contraction in your middle back (maintaining scapulae retraction). >From

this initial "start" position, the first pull begins.

The first pull involves extending the legs, imagining that you're pushing your feet through the floor. As the legs extend, maintain your trunk angle. This is very important. Your hips should not rise before, or faster than, your shoulders. Keep your back flat as you pull. The bar should stay on your shins. Wear some track or sweat pants if this bothers you. Allowing the bar to drift away from your shins is poor form. This first part of the pull gets the bar just above your knees. The second part of the pull involves pushing your hips forward. This drives the bar to the top of the lift. Continue to keep the bar as close to the body as possible. At the top, do not hyperextend the lower back or move the shoulders. If you've been correctly maintaining scapulae position throughout the movement, your shoulders should be in a posterior position anyway. Lower the bar in approximately the reverse sequence.

For practical reasons, it may not be possible to keep the bar quite as close to your body on the way down. Still, strive to do so. Continue to maintain your flat back position, and remember that the legs and glutes are the primary movers on this exercise. The false idea that this exercise is primarily a lower back movement has led to some very poor displays of deadlift form (and injuries) in many gyms. Keep tension in the legs and glutes throughout the eccentric (lowering) contraction of the exercise.

Lying Leg Curls

Lie prone (face down) on a lying leg curl machine. The roller pad should contact just above your heels. Curl the weight until the pad almost touches your glutes, and lower it under control. Keep as much of the front of your body as possible in contact with the bench throughout the exercise. For this, and all leg curls, a trick to shift emphasis away from the gastrocnemius (calf muscle, which assists in knee flexion) to the hamstrings is to keep your toes plantarflexed ("pointed") throughout the exercise.

Back Extensions

These are also known erroneously as hyperextensions. Stand in the back extension apparatus, making sure the pad in front of you touches at the proper position on your hips to allow a full range of motion. Lower your torso under control and raise yourself to a neutral posture (non-extended, non-flexed). Hyperextension beyond neutral is not necessary. Keep a flat

or slightly concave lumbar position during the movement.

Lying Leg Curls, Feet Outwards

These are performed like the lying leg curls described above, but your feet are kept in an externally rotated ("toes outward") position. Don't overdo it; a 45-degree angle relative to forward is fine. Ensure that you keep this position throughout each rep. You may additionally keep your toes plantarflexed as described above.

Dumbbell Deadlifts

These are performed like the barbell deadlifts described previously, but with a pair of dumbbells. In general, these are easier to do from a positioning standpoint, no matter the trainee's height or extremity lengths. Remember to keep the dumbbells vertically directly under the shoulders.

Half-deadlifts In Racks + Shrugs

Essentially, this is the second pull only of the barbell deadlifts described above, with a shrug at the top. Set the bar in a power rack so that the bar rests just above knee level. Perform the second pull of the barbell deadlift as described above. At the top of the movement, perform a barbell shrug. The shrug should be done in a vertical fashion, with no horizontal movement of the shoulders. Rotating or moving the shoulders laterally during a shrug unduly exposes the shoulder to injury. Reverse the movement and bring the bar to the pins. It's fine for the bar to touch the pins, but keep tension on the musculature while doing so.

Lying Leg Curls, Feet Inwards

These are performed like the lying leg curls described above, but your feet are kept in an internally rotated ("toes inward") position. A 45-degree angle or less is fine; make sure you keep this position throughout each rep. You may use the plantarflexed position, described previously, in addition to the internally rotated position.

Romanian Deadlifts

These are best done on an elevated platform. Take the bar out of the supports and step back. You should have a shoulder width stance. Bend your

knees slightly. The knee angle should not change during the lift; maintain this slightly bent position. Flex forward from the waist, letting the bar hang in your hands below your shoulders. Look forward and keep a flat back. Flex forward until further flexion would cause rounding of the back. The bar should stay in contact with your shins. Reverse the movement to raise the weight. Flex your glutes hard on the ascent. The (semi-) stiff-legged deadlift is similar, but the bar is held away from the body in that exercise.

1 And 1/4 Lying Leg Curls, Feet Outwards

These are performed like the lying leg curls described above, but at the top of the concentric (raising) portion, lower the pad j of the way in the eccentric (lowering) portion. Raise the weight to the top of the range of motion again, and lower it completely. This is one rep.

Standing Good Mornings

Stand with a shoulder-width stance with a bar across your shoulders. Bend the knees slightly. Maintain this knee position throughout the exercise. Follow the same form as the Romanian deadlift described above, although in this instance obviously the bar is in a different location. Some trainers recommend a rounding of the back during this exercise, but such a posture is not necessary for the exercise to stimulate the appropriate musculature and can be dangerous if the trainee uses this advanced technique improperly. For most people, most of the time, sticking with a flat back is best.

Seated Good Mornings

Sit on a bench with a bar across your shoulders. Perform a good morning as described above from this seated position. You may find it useful to do these in a power rack for ease of racking the weight.

Calves/Tibialis

Standing Calf Raises

Generally done in the standing calf raise machine, although can also be done with dumbbells. Ensure that you keep your hips and knees at a constant neutral joint angle throughout the exercise, and that you push off the balls of your feet, not your toes.

Seated Calf Raises

Generally done in the seated calf raise machine. Make sure your lower legs are truly vertical during this movement.

One-leg Calf Raises

Can be done in the standing calf raise machine or with a dumbbell. With the dumbbell option, stand on one foot on a raised surface with the other foot behind the working leg. Hold the dumbbell in the ipsilateral hand (the same hand as the working leg). Use the contralateral hand to hold on to a support, if needed.

Tibialis

The tibialis anterior is a muscle on the front of your lower leg. It is in many actions antagonistic to the calves. It can be worked in several ways. One option is to use the lying leg curl machine, but to put the pad on the top of your feet, and move your body using the tibialis anterior (dorsiflexion of the ankle, or pushing the feet "up"). Another option is to use leather straps and the low pulley machine, and still another is to use the decline bench in a similar fashion.

Abdominals

Low Cable Pull-ins

Attach a weightlifting belt to a low pulley. Fasten the belt around both feet. From a lying position, raise the knees to the chest, keeping your arms at your side on the ground for support. Straighten your legs for the eccentric portion of the movement.

Twisting Crunches On Swiss Ball

Lie supine (back down) on a Swiss Ball with your feet on the ground. Put your hands near, but not touching, your forehead. Flex your spine upwards as much as your flexibility will allow. Do not anchor your feet under anything or anyone. Don't flex from the hips. Spinal flexion is the goal here. As you crunch, alternate between reps wherein you also laterally flex right and reps wherein you also laterally flex left. Hold a dumbbell over your chest or hold a rope attachment from a low pulley to add resistance.

Twisting Garhammer Raises

These are done on a decline sit-up board. Lie on the board in the reverse fashion than if you were to do sit-ups. Hold the handle that should be just above your head. Flex at the knees and hips to bring the knees to the chest. Alternate twisting movements to the right and the left with your knees each rep.

Twisting Low Cable Pull-ins

These are performed as the low cable pull-ins described above, but with alternating twisting movements to the right and left with your knees.

Chest

Barbell Bench Presses

Lie on the bench so that you will unrack the weight at a point directly above the top of your head.

It's best to have a spotter help you unrack the weight, so as to prevent any undue stress on your rotator cuff muscles. Grip width is highly variable from trainee to trainee, but essentially your goal on a standard bench press is to use the grip width that allows you to move the most weight in good form. For most people, this is a few inches greater than shoulder width. Keep your feet planted on the ground, your butt and upper back firmly on the bench, and your scapulae retracted throughout the movement. In general, lower the bar under control to your lower sternum (approximate nipple level for men). Although some advocate a "J" bar path to directly over your face at the top of the movement, a strict vertical movement is neither better nor worse. Bodybuilders tend to favor the former method because the bar travels through a greater range of motion, while powerlifters tend to favor the latter method because the bar travels a shorter distance and greater load can be used.

Whatever the bar path, bring the bar to just short of elbow lockout. While some spinal extension is tolerable and in fact, necessary, don't overdo it. The glutes should not leave the bench during the bench press. Ever. Control the bar on the descent, and do not bounce the bar off the chest. It's been shown that the best bench pressers in the world have a slower descent than those who bench less. Keep a neutral wrist alignment. Have a

spotter help you rack the weight. A spotter is a good idea for all pressing exercises with a barbell, especially when using heavy loads.

Parallel Bar Dips

Stand in the parallel bars and grasp them so that your forearms are perpendicular to the ground. If the bars are in a V-shape (i.e., not parallel), you should be facing the V. For a chest emphasis, allow your elbows to drift apart to a comfortable location. For a triceps emphasis, keep your elbows pointed strictly behind you. Start from a fully extended elbow position.

Descend while keeping your back flat, chest and head up, knees flexed, and lower legs crossed. Your flexibility should dictate the range of motion, but in general, attempt to get your upper arms to parallel relative to the ground. It is fine for your upper arms to go below parallel if this doesn't cause you discomfort. Don't bounce at the bottom, and ascend in the reverse movement. Use a belt to add resistance.

Incline Dumbbell Presses

Lie on an incline bench. Resist the temptation to always use a low incline. All levels of incline should be used at one time or another for balanced development. Take a pair of dumbbells and kick them off your knees to a position just above your clavicular ("upper") pectoralis major. Your elbows should be pointing at the ground, your feet should be planted on the ground, and you should be looking ahead, which could be anywhere from the ceiling to the wall in front of you. Press the dumbbells together overhead. Two schools of thought for bar path apply here as they do for the bench press. Select one or the other based on your goals. Do not bang the dumbbells together. This takes tension off the muscles and serves no muscle or strength building purpose. It only serves to highlight a low self-esteem and a desire to needlessly draw attention to you. Lower the dumbbells under control to the start position.

Incline Barbell Presses

Performed essentially the same as the incline dumbbell presses above, but with a barbell. It may be easier to unrack and rack the weight without a spotter in this exercise in comparison to the flat bench press, but it's advisable to use one anyway.

Decline Dumbbell Presses

Lay on a decline bench. As with the incline press, don't be afraid to change your decline angle each time you use this exercise for a new training cycle. Bring the weight to the bottom of the sternal ("lower") pectoralis major. The vertical path of movement is essentially the only available bar path for this exercise.

Cambered Bar Bench Presses

The cambered bar has an region in the middle of the bar that takes an approximate 90-degree turn, goes parallel for a distance, and makes another approximate 90-degree turn into the original bar path. Thus, there is an area in the middle "cut out" for your body. This allows you to lower the bar further during the bench press. The guidelines for form on this exercise are essentially the same as for the bench press, but the range of motion is greater.

Decline Barbell Presses

Performed essentially the same as the decline dumbbell presses, but with a barbell. Have a spotter help you unrack and rack the weight.

Top Half Range Incline Presses In Rack

These are performed in the same way as the incline barbell presses described above, but only the top half of the range of motion is used. Set the bar in a power rack at a position that is approximately halfway between the beginning and end of your range of motion for the exercise. Incline press the weight as described above. Bring the bar back down to the pins, but don't rest the bar on the pins. Maintain tension on the musculature throughout the movement.

25 Degree Inclined Dumbbell Presses

These are incline dumbbell presses as described above, but the author dictates that you use an approximate 25-degree angle of the bench. For the geometrically illiterate, this is a little less than a third of the way from a flat bench to a vertical bench. The important thing is to pick an angle and stick with it workout to workout for that particular workout cycle, and in this instance, a relatively low angle is preferred for this workout cycle.

Flat Dumbbell Presses

These are performed as the barbell bench presses described above, but with dumbbells. Don't bang the weights together at the top.

Incline Cable Flyes

Place an incline bench between two low pulleys with handle attachments ("cable crossover machine"). Lie on the bench and grasp the handles. With the elbows slightly bent, flex the handles overhead. Keep the same, slightly bent, elbow angle throughout the exercise. The bottom of the range of motion will be dictated by your flexibility, but in general, your upper arms should go to approximately parallel to the ground or slightly below that level. An oft-mentioned visualization technique for this exercise is to imagine "hugging a barrel."

60 Degree Incline Dumbbell Presses

These are incline presses, as described above, but at a 60-degree bench angle.

This is two-thirds of the way up from a flat bench to a vertical bench, i.e., closer to a traditional shoulder press than to a bench press. This prescription is on purpose and intended to make the trainee use an uncommon bench angle for this particular workout cycle.

Lats/Scapulae Retractors

Supinated Chin-ups

A supinated grip for a chin-up means your palms are facing you. Grasp the chin bar with a supinated shoulder width grip. Keep your back flat or slightly concave, and look upwards. Your knees should be bent and your lower legs crossed. Use your lats to pull yourself up to and over the bar. Your chin should be above the bar at the top. Squeeze your scapulae together at the top, and allow them to drift apart naturally at the bottom. Lower yourself under control and do not take tension off the musculature in the bottom position. Use a belt to add resistance.

Close Parallel Grip Chin-ups

Performed as the chin-ups described above, but with a close parallel grip. Some gyms have such a grip available for chinning, some don't. If your gym does not, you can use a seated cable row parallel grip attachment. Place the attachment on top of the chin-up bar, and alternate reps to the left and right, since you will not be able to do a full rep without banging your head on the chinning bar.

Seated Cable Rows

Sit in the seated row machine, and grasp the attachment.

Keep a spinal alignment that is approximately perpendicular to the ground, and a flat back. This alignment should be maintained throughout the movement. Pull the weight to your abdomen. Your elbows should point straight back at the end of the concentric (pulling) contraction. Squeeze your scapulae (shoulder blades) together at the end of the concentric contraction. Reverse the movement, and do not take tension off of the musculature at the end of the eccentric contraction. Allow your scapulae to drift apart naturally during the eccentric contraction. Do not lean forward or back at any point during the movement. Concentrate on using your upper, not lower, back to move the weight.

One Arm Dumbbell Rows

Position yourself so that one foot is on the floor next to a flat bench, and the opposite leg's knee is on the bench. Place the hand nearest the bench on the bench. Grasp a dumbbell with the other hand (on the side where your foot is on the floor). Pull the dumbbell to your lower rib cage. Your elbow should be pointing up at the top of the movement. Retract your working scapula at the top. Reverse the movement, but do not take tension off the musculature or let the dumbbell touch the ground. Keep your torso still during the exercise, and keep the extraneous movement to a minimum. Perform all the reps for one side, then all the reps for the opposite side. Work your weaker side first.

Lean Away Chin-ups

These are performed as the supinated chin-ups described above (chin-ups are often meant to insinuate a supinated grip, and pull-ups are often meant

to insinuate a pronated grip). The difference is, during the ascent, lean your body away from the bar.

At the top, your body should be approximately parallel to the ground and the bar should be at about your lower sternum. The top of the movement thus mimics a rowing movement. Lower yourself in the reverse fashion.

Subscapularis Pull-ups

These are performed with a pronated (palms away from you) grip. The guidelines for form are essentially the same as those for the chin-up. The wrinkle here is, at the top, you push yourself in a direction parallel to the ground (away from the bar, but at the same height as the bar). This will cause you to lean away slightly from the bar. This action heavily works the subscapularis, a rotator cuff muscle that internally rotates the humerus (the other three rotator cuff muscles are external rotators of the humerus). Lower yourself from this position.

Bent Over EZ-Bar Rows

Take an EZ-bar (the short bar with several angles between each dumbbell hub). Stand with a shoulder width grip, slightly bent knees, a flat back, and your head up. Bend over at approximately a 45-degree angle at the waist. Several trunk angles are advocated; none are better than the others and all should be used. Pick a particular angle and stick with it for a training cycle. For the 45-degree trunk angle, pull the bar to your lower sternum. Maintain a flat back throughout the movement. Pull the scapulae together at the top, and allow them to drift apart naturally at the bottom.

Seated Cable Rows To Neck

These are performed as the seated cable rows described above, but the cable is pulled to the neck, rather than the abdomen.

It is often much easier to use a rope pulley attachment for this movement.

Decline Barbell Pullovers

Grasp a barbell and lie on a decline bench. Bend your elbows only slightly and keep this elbow position throughout the movement. Moving at the shoulder, bring the bar from above your head (as near the ground, without

touching the ground, as your flexibility will allow) to directly overhead. Visualize pulling the bar with your armpits, not your arms. Resist the temptation to bend your elbows and turn the exercise into a triceps movement.

Medium Parallel Grip Chin-ups

These are performed as the supinated chin-ups described above, but with a medium parallel grip. If such a grip at chinning height isn't available in your gym, find an attachment that allows this grip and put it over the bar.

One Arm Arc Dumbbell Rows

The initial position for these is the same as the dumbbell rows described above. The movement is different in that the dumbbell is brought to the hip. The dumbbell thus moves in an arc. Your forearm will be nearly, but not quite, parallel to the ground at the top of the movement, in contrast to the perpendicular forearm position of traditional dumbbell rows.

Rope Cable Upright Rows

Take a rope attachment on a low pulley. Stand in front of the pulley and grasp the rope with a pronated (palms down) grip. From this standing position, pull the rope to your clavicles, flaring the elbows laterally. Keep your palms facing towards the ground throughout the movement. Keep your back flat and still, and don't jerk backwards with your lower back during the lift. The cable and your hands should stay close to your body.

Triceps

Decline EZ-Bar Tricep Extensions

Take an EZ-bar and lie on a decline bench. Hold the bar, with a pronated (palms down) grip, vertical with elbows extended. Lower the bar to about your forehead level while keeping your elbows pointed upwards. Some lateral flaring of the elbows is permissible and does not constitute bad form. The important point is to not move from the shoulder joint. Reverse the movement to the top.

Decline Dumbbell Triceps Extensions

These are done much like the decline EZ-bar triceps extensions above, but with a pair of dumbbells. Hold the dumbbells with a pronated grip when your arms are vertical (end of the concentric contraction). Turn the dumbbells to a semi-supinated (neutral, hammer) grip at the bottom of the movement. On the concentric contraction, pronate the dumbbells back to their original position.

Seated Parallel Grip French Presses

This exercise requires a bar that allows for a semi-supinated (parallel) grip. This is usually a shorter bar with a split to two bars in the middle and two perpendicular bars for the parallel grip. Sit on a bench and grasp the bar. Point your arms directly vertical. Moving at the elbow only, lower the bar behind your head as far as your flexibility will allow. Do not move at the shoulder. Reverse the movement to complete the concentric contraction.

10 Degree Decline Close Grip Bench Presses

Find a decline bench that's set at about 10 degrees. If one is not available, any decline bench will do. Take the bar at about a shoulder width grip or slightly narrower. Have a spotter help you unrack the weight. Bring the bar to your lower chest while keeping your elbows tucked at the sides of your torso. Your arms should make a straight up-and-down movement during the exercise, and shouldn't flare laterally to a significant degree. Have a spotter help you rack the weight.

Rope french presses

Lie on a flat bench in front of a low pulley with a rope attachment. The pulley should be behind your head. Take the rope and extend your arms vertically. Moving at the elbow, lower the rope so that your hands are about at forehead level. Do not let the weight stacks touch or take tension off the musculature. Extend the elbows to bring the rope back to a vertical position.

Pronated Triceps Pressdowns

Use a high pulley and a straight bar attachment. A pronated grip is a palms-down grip. Use as great a range of motion as possible without let-

ting the weight stacks touch or taking tension off the musculature. Keep your shoulders back and your torso still. Don't lean forward. If something besides your triceps is doing the exercise, then something besides your triceps is getting the workout.

Close Grip Bench Presses With Chains

You will need chain attachments for the ends of the Olympic bar for this exercise. They are selected for this exercise to make it match the approximate strength curve of the triceps for most people. If the chains aren't available in your gym, do a standard close grip bench press. This is performed in the same manner as the decline close grip bench press described above.

Incline Barbell Triceps Extensions

Lie on an incline bench with a barbell. No angle of incline is better than the other and all angles can and should be used at one time or another.

You can use an Olympic bar or the shorter preloaded barbells often used for biceps curls. Hold the bar directly vertical with a pronated grip. Moving at the elbow, bring the bar back to about your forehead. Do not take tension off the musculature, and don't move at the shoulder. Extend the elbows to bring the bar back to vertical.

Biceps/Elbow Flexors

Incline Dumbbell Curls

Lie on an incline bench. Again, no incline angle is better than the other. Each produces slightly different motor unit recruitment and thus they all should be used. Choose one and stick with it for a training cycle. Take two dumbbells and hold them with a supinated (palms up) grip. Let your arms hang naturally down from the bench without losing tension on the musculature. Using your elbows only, curl the weights up as high as possible while maintaining tension on the musculature. Bringing the weights too high in arm curl exercises takes the tension off the elbow flexors and decreases their effectiveness. Lower the weights under control to the start position.

Incline Hammer Curls

Done as the incline dumbbell curls above, but with a semi-supinated (hammer, palms facing each other) grip on the dumbbells.

Standing Pause EZ-Bar Reverse Curls

Use an EZ-bar and a pronated (palms down) grip. Curl the weight using your elbows only. Keep your shoulders back and still and your trunk fixed. The location and amount of pause will be dictated by the tempo listed in the workout.

Seated Offset Dumbbell Curls

Sit on a bench with a pair of dumbbells. Hold the dumbbells with a semi-supinated (palms facing each other) grip so that the thumb side of your hand is contacting the inside of the dumbbell plate. Thus, you are holding the dumbbells "offset." As you curl the weights upward, turn the dumbbells to a supinated (palms up) position. As you lower them, go back to your original semi-supinated grip. The thumb side of each hand should stay in contact with the inside of the dumbbell plate throughout the exercise.

Scott Close Grip EZ-Bar Curls

A Scott curl is the same as a preacher curl. The name is in honor of the great bodybuilder Larry Scott, who was fond of this exercise. The Scott/preacher bench is the wedge shaped pad at arm level. There are seated or standing versions; in general, the seated version allows less cheating. Take the EZ-bar with as close a grip as possible on the knurled part of the bar with a supinated (palms up) grip. Keep your upper arms, armpits and chest in contact with the preacher bench at all times. Be especially sure to allow the bar to travel to the bottom of the range of motion, with elbows nearly fully extended but with tension still on the musculature.

Do not bring the weight too high on the concentric (lifting) contraction. Bring it only as high as you can while keeping tension on the elbow flexors. The idea is to avoid "resting" your elbow flexors at the top of the movement.

Seated Zottmann Curls

Zottman curls are performed on a bench with dumbbells. Start with the dumbbells in a supinated (palms up) position at the bottom. Lift them with this grip. At the top of the movement, change your grip to a pronated (palms down) position. Lower the dumbbells with this grip. With each rep, repeat the sequence.

Scott Gorilla Bar Reverse Curls

The gorilla bar is a contorted bar similar to an EZ-curl bar. The angles are more acute than those of an EZ-curl bar. If your gym doesn't have one, an EZ-bar will do fine. Take the bar and go to a Scott (preacher) bench. Use a pronated (palms down) grip. The same rules for form apply as for the Scott EZ-bar curls described above.

Low Rope Supinating Curls

Use a rope attachment to a low pulley. From a standing position, take the rope with a neutral (semi-supinated, palms facing each other) grip. As you curl the rope upward, supinate your forearms to bring the rope into a palms-up grip. As you lower the weight, bring the rope back to the semi-supinated position. Keep your shoulders back and your torso still.

Seated Close Grip Scott Curls

These are performed in the same fashion as the Scott close grip EZ-bar curls, but with a straight bar.

Delts

Seated Dumbbell Presses

Sit on a flat bench or a vertical seated bench. In general, the flat bench will be more conducive to good form and balanced development. Grasp two dumbbells and kick them with your knees to shoulder level. From this position, press them overhead. Do not bang the weights together at the top, and do not lock out the triceps completely. Reverse the movement to the bottom position, and do not take tension off the musculature.

One Arm Dumbbell Presses

These are performed in the same fashion as the Seated Dumbbell Presses, but with one arm at a time.

Forearms

Gripping Machine

There are numerous gripping machines in many gyms. Follow the instructions on the machine. If your gym doesn't have a gripping machine, there are several other exercises you can do to strengthen your grip. If you haven't trained your grip before, a good exercise to begin doing so is static barbell holds. Place a barbell in a power rack so that when it sits on the pins, you only would have to lift it several inches into a standing position with your arms hanging. In general, use a pronated grip. Hold the barbell for the duration of the reps x tempo listed in the workout. When you can hold the weight for that duration of time, increase the weight.

Decline Pronated Wrist Curls

Grab a barbell and sit on a decline bench. The declining part of the bench should be away from you. Take a pronated (palms down) grip on the bar. With your forearms in contact with the bench and your hands off the end of the bench, use your wrists to curl the weight. Use a controlled motion and do not bounce.

Low Pulley Pronated Wrist Curls

Use a low pulley and a straight bar attachment. Squat in front of the pulley and grab the attachment with a pronated (palms down grip). With your forearms resting on your thighs, use your wrists to curl the weight. Do not let the weight stacks touch.

Low Pulley Supinated Wrist Curls

These are performed as the low pulley pronated wrist curls described above, but with a supinated (palms up) grip.

Bonus Reports

Triple Training Reports

by Evan R. Peck, M.D.

Biography: Evan R. Peck, M.D.
Overcoming Training Plateaus
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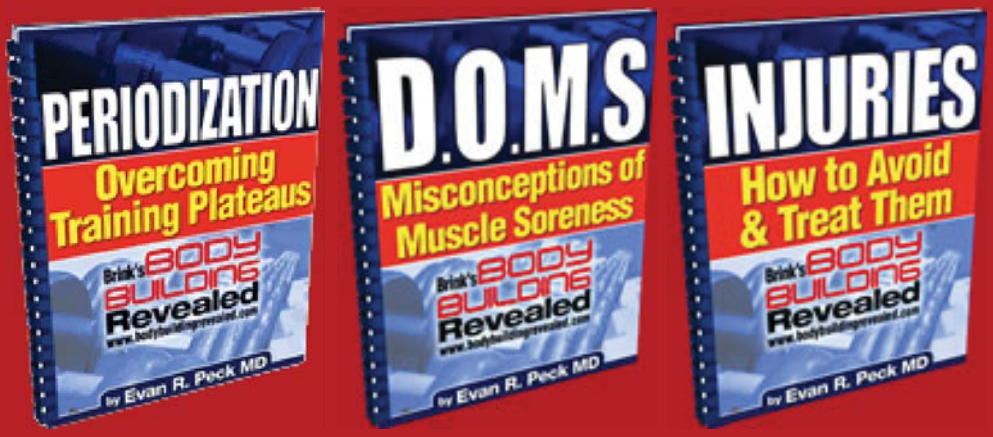

Biography: Evan R. Peck M.D.

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Evan R. Peck, M.D. is a resident physician at the Baylor College of Medicine in Houston, Texas. He is currently completing residency training in physical medicine and rehabilitation at Baylor, including training at The Institute for Rehabilitation and Research, consistently ranked among the top five rehabilitation hospitals in the United States.

Evan attained his bachelor of science degree in exercise science from Stetson University. He then went on to obtain his medical degree at the University of Virginia before coming to Houston to begin residency training. He has done research in branched-chain amino acid supplementation during resistance exercise as well as vascular endothelial cell-monocyte interactions in diabetes.

His current clinical and research interests include rehabilitation of musculoskeletal injuries, biochemical etiology and treatment of chronic pain syndromes, electrodiagnosis, and interventional management of spasticity in brain and spinal cord injury. Upon completing residency, he plans on completing fellowships in sports medicine and pain medicine.

Evan has played sports his entire life and has weight trained for a decade. In addition to his academic studies, he has done extensive studying of the topics of training and nutrition, particularly with respect to the training methods used in eastern Europe and the nations of the former Soviet Union. He has applied this theoretical and practical knowledge and experience with himself and dozens of informal personal training clients with a wide array of needs and goals for several years.

He lives in Houston with his wife, Jennette, and their daughter, Hannah.

Evan's forum name is erp7e. This bears no significance other than it was the email prefix given to him in medical school and he used it as a username at the time.

Overcoming Training Plateaus

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Initially, it is relatively easy for most trainees to make progress on a strength training program. After this initial break-in period (which, incidentally, is the period of time studied by a significant portion of North American strength training research), making strength gains becomes progressively more difficult. Often, trainees interpret this stagnation of progress as a need to buy the latest miracle supplement or turn to performance enhancing drugs. Such a step is - in the overwhelming majority of cases - unnecessary (and in some cases counterproductive) to make appreciable gains in strength and muscle size.

Unfortunately, there is a great deal of misinformation in the popular press regarding how to put together a strength training program that will offer consistent gains over time. Part of this is due to decades-long monopolization of the popular lay press bodybuilding magazines by one individual in particular. What this person has done positively for bodybuilding cannot be understated, however, his training "principles" and the dogmatism and widespread "champion" endorsement with which they have been presented have led to many frustrated weight trainees (and perhaps, intentionally or unintentionally, increased sales of worthless supplements, but that's another story).

Although there is a more pluralistic view in the lay training press these days, the "principles" persist in many ways, and so does the confusion. Essentially, the traditional view was that of classic progressive overload. Just keep adding weight to the bar, a little at a time, and like Milo carrying his calf, you would progressively grow bigger and stronger. If this doesn't work, the traditional model argues, you need to "bomb" and "blast" and "confuse" your muscle with greater and greater numbers of exercises, sets, reps, and training sessions. While this sounds good on paper, it has been shown empirically and in the literature to not work long term, especially beyond the initial break-in beginner's period described above. What has been found over decades of strength training is that planned and purposeful variety in the training process is necessary. There is a difference, however, between randomly doing different things every time you go to the gym, and planned, purposeful variety. What I will seek to do in the following discussion is look at basic ways to avoid and get over training plateaus through smarter program design and planning.

Overseas, particularly in the former Communist bloc countries, coaches and trainees had the privilege of not being exposed to the dogmatic principles that North Americans were. Consequently, they had to figure out for themselves what actually worked. These nations advanced training science, decades ago, far beyond the level attained in most of the West even today. The success of these nations, in strength sports in particular, attracted attention from the West. Much of this information began to be leaked to the West, but was and continues to be misinterpreted by many. The overall concept is very simple. For long-term success in weight training, you must have a cohesive plan directed at a particular goal or goals. To often with the traditional model, there is no plan beyond "do more," which, for many reasons beyond the scope of this discussion, does not work well for the vast majority of trainees.

The big buzzword here, which allegedly "came" from the East, is periodization. The concept of periodization added a different perspective on training than the traditional models available in the West at the time, but in many ways also compounded the training confusion, both among Western exercise scientists as well as trainees. Unfortunately, one particular model of periodization was taken by many in the West to be periodization. This may be the model you have been most exposed to.

The plan in this model typically consists of various phases (mesocycles) within a larger plan (macrocycle). Each mesocycle generally consists of multiple microcycles. A microcycle is a small training unit, generally a week, that is made up of multiple planned training sessions. The Western-interpreted linear periodization model generally starts with a hypertrophy phase (mesocycle) that consists of high volume and low intensity, followed by a strength phase that consists of lower volume and higher intensity, followed by a competitive/peaking phase, where volume is often markedly reduced and intensity markedly increased relative to some unknown maximum performance that may no longer apply. This is usually followed by an off-season or active rest phase.

Understand that I have not just described "periodization;" I have described one model of it, and certainly not the most productive model for most people beyond the initial stages of training. The important and practically applicable concept here is that periodization simply means some type of long term planning; it does not dictate that you follow the phases described above and so often promoted in the West over the past couple of decades.

There are several drawbacks to this model, especially for the somewhat experienced trainee who adapts to training well. First, the adaptations gained in each phase are lost in the next. Any of the hypertrophy gained in the hypertrophy phase has probably dissipated by the time the competitive phase rolls around. Additionally, while using relatively lighter weights in the hypertrophy phase, the trainee loses strength and is no longer working relative to the maximum that was attained in the previous competitive phase. This model may have some application to beginning trainees who do not quickly adapt to a particular stimulus, or are naïve to a particular stimulus.

There are several basic ways to plan training. I have already described one of them. Another option is to alternate higher volume phases with higher intensity phases of relatively short duration. This concept has been popularized in the West by such strength coaches as Charles Poliquin and Ian King, and is often called undulating or alternating periodization.

This is the type of periodization outlined in the training section of the e-book, and is applicable to and effective for a large proportion of the weight training population. This model overcomes some of the drawbacks of the first model, in that one does not get away from a particular type of training for very long. When strength gains begin to diminish during a lower intensity phase, the trainee is alternating back to a strength phase relatively quickly. Conversely, when the benefits of a higher-volume phase begin to diminish during high intensity phases, the trainee is alternating back to that type of training relatively quickly. For the trainee whose adaptation abilities have outgrown the first model, this model of training may be more effective.

Taking the changes from the first to the second program a step further, one could shorten the phases to the point where all the training qualities are trained in the same training week or microcycle. With this type of periodization, one rotates different methods to accomplish the same means, but no particular training goal is neglected entirely. On a very basic level, you could say that strength and hypertrophy, volume and intensity, are both trained at all times. Often, this model is used in various strength sports at the elite level, and various strength sub-qualities are trained, such as speed-strength, strength-speed, maximal strength, etc. Although one quality may be emphasized in a relative sense over another at a given time, no quality is completely neglected. In general, this is the conjugate method of periodization. It may have applicability to a wide spectrum of

trainees, but is more difficult for the uninitiated to implement. For the advanced trainee, this type of training is nearly essential for continued development.

There are many other periodization models, but the three described above, and variations of them, are probably most applicable to most strength trainees. As mentioned above, the most important thing is that you are planning your training in an organized fashion directed towards a goal. Planned variation of the training stimulus over time, in contrast to just "doing more" and effectively banging your head against the wall, will go a long way towards preventing many plateaus in your training progress.

Aside from poor planning and poor implementation of variation of the training stimulus, there are many other things that can cause training stagnation. One is simply chronic overtraining. Part of this relates to using appropriate loading parameters in training. As mentioned in the training section of the e-book, parameters such as frequency, exercise selection and order, sets, reps, tempo, rest intervals, and other parameters should be appropriately manipulated for your particular situation.

Even when all of the preceding is done properly, there is potential for chronic overtraining. It is useful for almost everyone to take planned rest weeks, especially those with many other stressors going on in their lives. In general, a good rule of thumb for most people is to take a rest week every 6-12 weeks of hard training or so. I would encourage you to still engage in some type of light recreational activity during this period, and I would also caution you to not go overboard with consecutive rest weeks. Taking a month or two off can really set you back. It is generally better to have a rest week every couple of months, rather than to train for ten straight months and then take two straight months off.

Another major precipitant of plateaus is weak points. When certain patterns of training are used excessively, there are actin-myosin pairings, motor units, muscle groups, body parts, and joint angles that become less used and potentially weak. This can lead to stagnated progress. A large portion of this concept is exercise selection. As mentioned in the training section of the e-book, it is important to use the exercises that give you the most "bang for your buck," but it is nearly as important that you do not only use the exercises at the most advantageous joint angle.

For example, bringing up your high-incline press or your front squat could

do wonders for your progress. Do you only do triceps extensions in a position that will allow you to lift the most weight? Try them from a weaker angle, and work on bringing up your strength at this angle. Muscle growth and strength in other exercises will follow. Most people know what they are good at, and what they are not good at. The problem is that most people continue to do what they are good at, and not work on what they aren't good at. This could mean a particular body part, a particular exercise, or a weak joint angle. If something is lagging, train it first in the week or the session, with more volume, or with more load, as appropriate. Do what is necessary to make progress. If you do what you've always done, your results probably will not improve. Having the courage to train your body instead of your ego will pay off in the long run.

The power rack is an important tool in this regard. This item is sorely underused in most gyms. It is often perceived as being "only for powerlifters," but bodybuilders can benefit significantly from training other joint angles made possible with the power rack. To this end, various partial and isometric movements are useful. It is important, however, to understand that these movements, like all movements, have drawbacks, and there are serious pitfalls to using only partials or static contractions in your training. Used correctly, they can be a great adjunct for the right trainee in the right circumstances. Partial deadlifts in the rack and bench press lockouts in the rack are great exercises for the bodybuilder.

There are many advanced methods for overcoming strength and hypertrophy training plateaus, and it is not my aim to cover them all here. The basic principles to understand are: (a) most of us cannot simply add weight to the bar each week, without changing your program, forever, (b) some type of long-term plan is generally necessary for continued progress, (c) there is more than one way to plan or periodize training, and it may take some consideration and experimentation to figure out what is best for you, (d) take rest weeks, and (e) train your weak points, including getting acclimated with the power rack. Taking heed of these general principles will go a long way toward preventing many training plateaus.

Misconceptions Of Muscle Soreness

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A lot of attention is given to the topic of delayed-onset muscle soreness (DOMS) among the weight training community, particularly among bodybuilders. Research as well as speculation has been directed at determining its causes. While some of this information is interesting on an academic level, most trainees are not primarily concerned with this. The more practical issues for most are: 1) what is DOMS? 2) what does it mean? and 3) how do I alleviate it?

Delayed-onset muscle soreness is a relatively common phenomenon among weight trainers whereby, approximately 24-72 hours following a weight training session, a deep soreness is experienced in the exercise muscle groups, often exacerbated by contracting the muscle. The phenomenon is particularly marked when a stimulus is new, e.g. a change in load or exercise pattern that is different than what the body is conditioned to. DOMS is probably due to microtears in the muscle fibers, or myofibrils, and the associated inflammatory reactions involved.

DOMS is not lactic acid. If the levels of lactate encountered during strenuous exercise remained present for days after the exercise session, as the gym lore might have you believe, then your remaining time on this planet would be short lived unless you had access to a dialysis machine. Acid-base balance is tightly regulated by the body, and any long-term derangement can be potentially very harmful. The "burn" you feel during a set is associated with lactic acid buildup; DOMS is not. Note that the "burn" dissipates relatively quickly following the conclusion of a set.

DOMS is also not a ligament sprain, a major muscle tear, or a bone fracture. Differentiating "good" pain from "bad" pain (neither of which are all good or bad, incidentally) is difficult to describe, but most experienced trainees learn to distinguish these. When in doubt about a musculoskeletal complaint, consult a physician.

As mentioned above, investigating the mechanism of DOMS gives you one piece of information, but it does not answer the next question: what does it mean? There is a widely held belief in gym culture that DOMS is somehow "needed" for growth, that if soreness did not occur, the workout must not have been effective. While there certainly is a strong argument that mi-

croscopic myofibrillar tears are the cause of DOMS, and that repair of myofibrillar tears are probably involved in the muscular hypertrophy process, such an assertion does not dictate that DOMS must be present in order for hypertrophy to occur. There has never been any reliable data to indicate that DOMS is absolutely needed for muscle growth to occur, and any such supposition is pure gym lore and conjecture.

Without getting into biochemical pathways, and sticking to the spirit of what's practically important here, reevaluate why you are going to the gym. Is it to get sore? Or is it to get larger muscles? Less fat? Stronger? Healthier? I would venture to guess that the answer to the former question, for most, is no. If you were to get bigger, or stronger, or leaner, without getting sore, would you be disappointed? I should think not. The bottom line is that soreness may or may not be linked to the muscle growth process, but it is not a reliable indicator of muscle growth or training response.

As I've said many times, the best indicator of training response is, you guessed it, training response. If your goal is to go from benching 250 pounds for a 1-rep maximum (1-RM) to 300 pounds for a 1-RM, and you accomplish this, does it matter whether or not you got sore after every session? Judge your training sessions by objective data, by whether you are improving towards your goals, not by unreliable subjective feelings such as degree of soreness. I'm not saying that subjective feelings are unimportant, I'm saying they are unreliable, especially when such feelings are not the goal of the training process.

Now that we know, on a practical level, what DOMS is and its value, or lack thereof, in evaluating the training response, it's useful to discuss what to do about it. The best way to deal with DOMS is not to get excessively sore in the first place. While it commonly is unavoidable in training, being constantly sore to the point of debilitation is probably not the best way to train.

To this end, there are several issues to consider. First, consider the volume and intensity of the training session relative to your conditioning level. Very often, an enthusiastic beginner will do a two-hour workout for the biceps, thinking he is doing the best thing for muscle growth, especially when he experiences debilitating soreness days later. His enthusiasm probably will wane when he returns to the gym and can use less weight for fewer reps on his exercises. Even more advanced trainees are prone to doing excessive work relative to their current conditioning levels in a quest for sore-

ness and visceral validation of their workouts. Again, it's important to look at the reason you are training and to perform the appropriate workout to achieve those goals for you personally, at the present time.

The next issue is exercise selection. Bodybuilders tend to have more DOMS than powerlifters, Olympic weightlifters, or other athletes. This may be due to greater variety in exercise selection and joint angle and stimulation of different motor unit recruitment patterns, therefore greater potential for microtears in myofibrils previously not heavily stimulated. Approach this issue the same way you do volume and intensity: variety is good only as long as it is needed. Be judicious about introducing too many new movements at the same time, especially for excessive volume or load. There's training stimulus, and then there's simply injuring yourself. An interesting observation among bodybuilders is that soreness is greatest the first time using an exercise, but most of the muscle building benefits occur after subsequent training sessions using that exercise for most trainees. There tends to be less soreness after these subsequent sessions, yet there is a generally greater hypertrophy response, which is essentially paradoxical if you follow the gym lore about soreness.

A third major issue in the context of workout design is training frequency. Certainly, repeated sessions that damage the myofibril may cumulatively cause DOMS. The underlying principle expressed above is also true here: use the training frequency that produces the results you are after, not that which causes the most subjective feelings of being beat up.

Even if you take heed of the proceeding, and the numerous other workout parameters that, if implemented improperly, may lead to excessive soreness, you still may get sore. It's simply part of weight training to occasionally get sore. So, what to do?

Nutrition, particularly attention to electrolyte and water replenishment, may play a role, as may protein and fat intake to provide the necessary substrate for repair of the muscle cell. The various antioxidant formulas on the market may also be of use in the prevention and alleviation of DOMS. Non-steroidal anti-inflammatory drugs (NSAIDs) may be used as well, but consider an important caveat. NSAIDs inhibit the production of certain substances (prostaglandins) that may be closely associated with the muscle growth process. Whether this is relevant in the setting of DOMS is not entirely clear, but it is something worth considering when choosing these agents.

Restoration methods are very underused among most trainees. There is a lot of concern about training and diet, but not much about recovery methods. The functions of these methods are many, but in many cases they may help alleviate DOMS as well as improve the training response (again—a paradox if you follow the gym lore). Consider three major modalities that are easy to implement: 1) stretching, 2) massage, and 3) use of temperature change and contrast.

Nearly everyone should be doing some form of stretching. There is a lot of debate about the type and timing of various stretching modalities, particularly in reference to the timing of the weight training session, but debating such is not my purpose here. The point is that you should be doing some type of flexibility and range of motion training that is appropriate to your individual needs, goals, and capabilities. The other major point is despite all of the current debates about stretching, it is not an excuse to do none of it whatsoever. Correct implementation of stretching may improve the primary training response, prevent future DOMS as well as injury, and alleviate previous DOMS or injury.

When most people think of "massage" they think of either (a) something that has nothing to do with a sports or weight training discussion, or (b) something very expensive that must be performed by a professional. While either of these definitions are true in the right context, there is also the possibility of performing therapeutic massage at home with simple implements that may provide many benefits, including alleviation of DOMS. Mechanical stimulation of the affected area may help clear waste products and speed the muscle repair process through various mechanisms. There are several simple massage tools available worth trying, including large foam rolls, massage sticks, and other massage rollers and tools. Most of these are fairly inexpensive and easy to implement, and the benefits can be profound. As with stretching, massage can be timed various ways around and even within the actual weight training workout.

There is significant utility in the application of heat to an area affected by DOMS. Primarily, this may help by increasing circulation to the area and stimulating various other mechanisms that may promote and speed the recovery process. There also may be benefit to application of ice through other mechanisms. Ice massage has been used with at least promising empiric benefit among many. Also, there may be value in contrast showers, i.e. applying cold and heat alternately. Again, these modalities are easy to implement, safe, and have a relatively high reward : risk ratio.

The bottom line: soreness is a side effect, not the goal, of training. Alleviating it may improve the training process, and it certainly provides symptomatic benefit. Look at it as a nuisance, not your reason for going to the gym.

Weight Training Injuries

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Note: The information contained herein is for informational purposes only, and does not replace individual examination and treatment by a physician. If you think you are injured, you should seek the services of a qualified physician.

As with nearly all recreational activities, there is potential for injury with weight training. Some of these are acute, some are chronic, but in either case, the best way to deal with weight training injuries is to prevent them from happening in the first place. In the event that one does occur, there are circumstances under which you may be able to train around the injury or rehabilitate it yourself. There are cases where this is not possible, and as indicated above, do not hesitate to seek the services of a physician if you believe you have been injured.

I will first address acute injuries due to weight training, although I feel these are relatively less common than chronic conditions. It is beyond the scope of this chapter and book to list every conceivable musculoskeletal injury and its complete management, so I will address general principles of prevention and rehabilitation of common weight training injuries and problem areas.

Prevention of an acute injury during weight training is actually quite simple. Proper form and technique during an exercise will prevent 95% of these. Weight training is not an activity involving the degree of three-dimensional and unpredictable movement that you might expect with, say, basketball or football. Additionally, there is ideally no contact, pushing, pulling, pinning, or awkward positioning induced by an opponent or another person. As such, the potential for acute injury in the weight room should be much less than on most playing fields. As such, proper technique in weight training exercises is of utmost importance. In this regard, if you do not know how to do an exercise, do not hesitate to consult an appropriate resource or qualified trainer.

There are other issues aside from technique to consider in prevention of acute injuries in the weight room. These include, but are not limited to: 1) failure to warm up properly, 2) undue jumps in loading on an exercise, 3) doing work far beyond your current level of health or conditioning , 4)

failure to use spotters when appropriate, and 5) failure to ensure the equipment and/or weight room environment is safe prior to beginning an exercise.

Warming up is a topic that is often misunderstood, especially in the context of weight training. In recent years, more books and videos are being published dealing with this topic, which has both alleviated and contributed to further confusion. It is important to deal with basic principles before burying yourself in the details. For example, you should warm up in nearly all cases in the weight room prior to beginning your work sets. That much we know. In other words, all the confusion regarding the various warm-up methods is no excuse to not do a warm-up at all.

At the very least, you should include lighter sets prior to your weight training work sets. A common mistake is to do too few warm-up sets, and to do them for excessively high reps. I recently looked at a program in a popular magazine. Occasionally I subject myself to these abysmal publications, to see what the lay press is promoting and to see how poorly they are interpreting the literature. This helps me understand the perspective of many of the people I advise. At any rate, this particular program had the trainee doing two sets of 15 as warm-ups prior to a heavy set of six to failure.

This approach is flawed. First, you are using unnecessary substrate and potentially accumulating excess lactate during the high-rep sets. This may interfere with the recruitment of high-threshold motor units during subsequent sets. Secondly, it does not permit loads that are consistent with what you will be working with. In other words, you will use very light loads during the warm-up, nowhere-near-15RM (repetition maximum) sets of 15, and then go into a heavy set of six, certainly at or perhaps even above one's 6RM. For many people this will be close to a doubling of the weight. A jump this drastic increases the chances for injury.

A warm-up should have carryover to the activity. A more appropriate warm-up for a heavy set of six would be 3-5 sets of six until you approach your work set weight. This would be for the first exercise for a particular body part in the workout. For subsequent exercises for the same body part, you could use fewer sets, perhaps even none depending on the load being used. In general, the heavier you are lifting, the more warm-up sets you should use. However, there is no rule that warm-up sets should be for high reps, particularly if your training is going to be with low reps.

Optimally, a warm-up would also include other movements that would prepare your body for the activity to follow. These would be done prior to any of your regular strength training. This can perhaps go beyond the traditional notion of "raising core body temperature" to actually preventing injury as well as leading to a more productive workout.

Some examples of activities to include in the warm-up period are general activities (e.g., the stationary bike, one option but perhaps not ideal for a weight training workout), stretching (the debate as to what type of stretching is ideal for pre-workout, if any, is long and not worth rehashing here; suffice to say that pre-workout stretching of some kind is an option but perhaps not a necessity), so-called "prehab" movements (movements that train commonly injured areas or areas that may not be addressed well by the main workout, such as the rotator cuff), and movement preparation or control drills (activities which teach the body to activate certain musculature and/or movement patterns, which may facilitate a more effective workout). All of these topics are addressed at length elsewhere; this list is merely meant to outline some of the common options for a warm-up prior to weight training.

The next cause of acute weight training injury is jumps in loading. This was briefly alluded to above. During your warm up and/or work sets, a good rule of thumb is to not jump to a load that you have not approached earlier in the workout. This also applies from workout to workout. Be judicious in your jumps in loads used from workout to workout. Of course, increases in loading is part of the training effect we are after, but all in due time. Consider that if you added 5 pounds to your bench press every week, you would be benching close to 800 pounds in three years. Very few people have reached this level of maximal strength, even after decades of training. This example demonstrates on one level the ineffectiveness of the pure progressive overload system (more on that later), and on another level that there is no rush to add 50 pounds to the bar every week—doing so will probably not increase your long-term progress beyond what you would have attained anyway, and will certainly expose you to greater injury potential.

A somewhat related point, as mentioned above, is doing work within your current state of health and conditioning. Many people erroneously believe that if they are out of condition, they should avoid heavy weights in the weight room, yet they are okay to lift light weights for a long time. This practice exposes you to greater injury potential. As you become fatigued

you will be less able to maintain proper technique late in the workout and may expose yourself to injury. Likewise, if you have an illness, disease, or health condition, be judicious in the amount and type of exercise you do. When in doubt, consult your physician.

The last two major points, using spotters and ensuring equipment is safe, are somewhat related. Before you do a lift, ensure you are doing it in a safe environment with safe equipment. Take a look around before you step back in the squat rack. Take a look at the pulley on the machine you are using. Ask someone to spot you if you attempting a personal record in the bench press. These things are common sense but a strange thing happens to common sense for some people in the weight room. Don't let it happen to you or you may have an injury that could have been easily avoided.

Chronic injuries are more common than acute injuries with most weight trainees. On one level this is theoretically a result of many years of external loading—one must recognize the potential for wear and tear on cartilage and other tissues. On another level, weight training can actually go a long way toward preventing this wear and tear.

Other chronic injuries can often be avoided through appropriate program design. There are common problem areas that are involved in most chronic weight training injuries. Principally, these problem areas include the shoulder, lower back, and knee. There is certainly injury potential for other areas of the body, but my aim here is to outline the most common chronic injuries for most trainees in the weight room.

Chronic shoulder injuries are quite common among those who have weight trained for several years, particularly in North America where bench pressing is an obsession and serious dedication to rows, deadlifts, and Olympic lift variations is rarely practiced, at least by non-athletes. Typically this is due to one or more of several pathological states of the shoulder, including impingement syndrome and biceps tendonitis. These states are often due to an imbalance among the various muscles that act on the shoulder.

This is not meant to be a treatise on functional anatomy, but it is important to briefly consider some of the major roles of the major muscles that act on the shoulder at a very basic level. The pectoralis major ("pec") flexes the humerus (upper arm bone), something most of us are aware of. It is also an adductor of the humerus (i.e. brings it closer to the midline of the body) as well as an internal rotator of the humerus (i.e. rotates it inward towards

the midline of the body). I outline the functions of the pecs because they are the most commonly overworked upper body muscle relative to other muscles that act on the shoulder. The latissimus dorsi ("lat") extends the humerus and is thus commonly thought to be an antagonist of the pec. However, the lat shares with the pec in adducting and internally rotating the humerus. Thus, this assertion of antagonism is both true and false. The bottom line is it is important to consider muscle actions, and not merely individual muscles, when assessing balance in program design.

The external rotators of the humerus, some of which make up the group of muscles known as the rotator cuff, act against the internal rotation strength of the pecs and lats. Additionally, muscles of this group as well as others act to abduct the humerus and thus antagonize the adduction strength of the pecs and lats. The rotator cuff is the primary group of muscles that stabilize the glenohumeral joint, as well as decelerate and antagonize some of the aforementioned larger muscles of the shoulder. Consider all these movements in program design. It is important to consider not only volume of work in each direction, but also prioritization in the workout as well as loading. This will serve to ensure shoulder stabilization and optimize function.

It is not necessary to use complex mathematical formulae to ensure that your workout volume is exactly the same in terms of poundage, sets, and reps in every conceivable direction. Keeping with the spirit of this chapter, my goal is to stick to the basic principles while making you aware of considerations that should go into training decisions to prevent injury.

In this vein, in the context of prevention of shoulder injuries, you should do something in your training involving external rotation and abduction, particularly if: (a) you do a good deal of horizontal pressing, vertical pulling, or both, as many bodybuilders and strength trainers do, (b) you do little or no Olympic lifts or their variations, or (c) some combination of these two.

The Olympic lifts, by their nature, involve external rotation and abduction of the humerus, in addition to their primary lower body actions. This is not to say the Olympic lifts are a necessity in your training. In fact they may be wholly inappropriate based on your particular goals. I only make the point that if you are not using Olympic lifts, as most of you will not be, you must take other measures in the program to contribute to shoulder stability. Olympic lift variations, as well as deadlifts and their variations, also offer the benefit of providing loading for the upper back musculature that may

contribute to antagonizing the upper body pushing muscles.

On a practical level, be sure to include horizontal pulling and vertical pressing in your workouts, in addition to the more common horizontal pushing and vertical pulling. Pay particular attention to the horizontal plane. If you are doing a good deal of benching, you should be doing a good deal of rowing. Top powerlifters have realized this for decades and you will almost never see a top bencher who does not include a good deal of rowing in the training program. Additionally, it is important to do some kind of rotator cuff training, including external rotation work, as some part of your program. As mentioned previously, it may be worthwhile to do this work prior to your regular training.

Rehabilitation of a chronic shoulder injury involves many of the same principles. Clearly, if when looking at your previous programs, you are doing a ton of horizontal pressing and/or vertical pulling and not much to antagonize this workload, and you are beginning to have chronic shoulder pain, you need to address these deficiencies in the training program. Quitting all horizontal pressing for a period of time is not an uncommon or inappropriate remedy many times. Specialization of horizontal pulling, external rotation, or shoulder abduction may also be appropriate in the right context. When in doubt, consult an appropriate rehabilitative specialist. And do not perform a movement that causes pain. Injuries can, at times, be trained around, but it is important to not force a movement when it is worsening the symptoms. See earlier comment about the evaporation of common sense when many enter the weight room.

Also, do not neglect the importance of stretching in the prevention and rehabilitation of shoulder and any other injuries. Appropriate tissue length relationships may contribute to joint stability and long-term health. As alluded to earlier, there is much debate currently in the strength and conditioning community regarding the appropriate modality and timing of stretching relative to weight training and other activities. This is not meant to be an all-inclusive discussion of the role of stretching, but just to cite a practical example, consider that if your pecs and lats are very tight from a lot of loading over time, stretching them diligently will serve you and your shoulders well, particularly if you are working to increase the strength of their antagonists. This is not to say that other muscle groups should not be stretched; again, merely citing a practical example where stretching may aid in the prevention or rehabilitation of a potential injury. For effective stretching programs, there are numerous articles and books dealing with

the topic, and again, that is not the scope of this chapter.

The lower back is another problem area. Again, prevention and rehabilitation of these chronic injuries often involves appropriate program design. There are many muscles that act upon the hip and spine. Lower back pain has many etiologies, but in many cases there is some deconditioning or inappropriate tissue lengths among these muscles involved.

To keep things simple and practical, strong abs will go a long way towards alleviating back pain. Entirely too much popular press has been dedicated to training "your core," but as with many popular exercise concepts, there is some merit down there somewhere under all the hype and marketing. As with the shoulder, I will go over some important concepts to keep in mind with respect to the lower back.

The rectus abdominus (the "six pack" abs) act, among others, to flex the spine relative to the pelvis. The erector spinae (group of muscles often referred to colloquially as "the lower back") act to antagonize this action. Additionally, there is a group of muscles that act to flex the femur (thigh bone) relative to the pelvis, including the rectus femoris (one of the quadriceps muscles). Naturally, there is a group of muscles that act to extend the femur relative to the pelvis as part of their actions, including the gluteus maximus and the hamstrings muscle group. These muscle groups, along with the erector spinae, are often referred to the posterior chain because they often act as a unit in hip and spinal extension. Keeping these actions in mind in program design will bode well for lower back health.

In a practical sense, back pain can often be alleviated by paying particular attention to strengthening the abs and stretching the hip flexors, which are commonly shortened not only through weight training but through everyday activities, including walking. This may serve to improve pelvic alignment and improve posture, thus alleviating or preventing injury.

The other major practical consideration is strengthening of the posterior chain, which is often neglected. Often it is only trained through leg curls, which do work some of the hamstrings' knee flexion function but not significantly the hip extension function. In this respect the rest of the posterior chain is often neglected. A strong posterior chain will serve lower vertebral and pelvic health well. As with the shoulder, maintenance of appropriate tissue length relationships through stretching is an important consideration, too.

With the knee you have to consider not only balance between flexion and extension, but balance among the knee flexors, and balance among the knee extensors. With regard to the first consideration, chronic or even predisposition to acute injury, e.g. ACL tears, can be propagated by quadriceps/hamstrings imbalance. Again, these are general concepts and there is no magic ratio or muscle balance formula that will work for everyone, but a gross imbalance in training between exercises that emphasize the quadriceps, and those that emphasize the hamstrings, is a recipe for potential knee problems. As has been continually mentioned, flexibility training is important here, too.

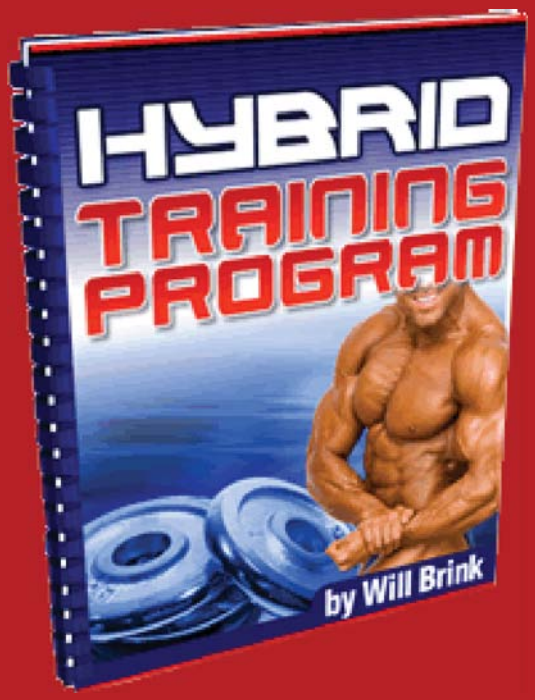
With regard to imbalance among muscles of the same muscle group, one of the most common examples is that which may occur among the quadriceps. One of the more common chronic knee injuries is patellofemoral syndrome, manifested as a primarily anterior knee pain and the most common cause of chronic knee pain in those under age 45. This is often at least in part due to an imbalance between the vastus medialis ("inner quad") and the vastus lateralis ("outer quad") as well as other musculotendonous structures which may affect patellar ("knee cap") alignment, including the iliotibial band, a thick tendon which runs down the lateral leg. In a practical sense, it is important to pay due diligence to stretching the iliotibial band and strengthening the vastus medialis to ensure proper patellar alignment. In particular, wider stance squatters will want to do specific exercises for the vastus medialis to prevent injury or to rehabilitate patellar pain if it is already present. And as stated earlier, avoid movements that cause pain.

In general, many chronic weight training injuries are often due to errors in program design. When remedying these, it is important to avoid movements that cause pain to the area, but also pay attention to fixing the problem. As the old adage states, if you do what you've always done, you will get what you've always gotten. Weight training is a very safe activity, and will actually do more for injury prevention than almost any modality of physical activity if applied properly. So get big, get strong, and get lean, but be smart and stay healthy while doing it.

Bonus Reports

Brink's Hybrid Training System

by Will Brink



Brink´s Hybrid Training System

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As this e-book is full of good training information, I don't plan to rehash that information here. What I plan to do is briefly cover some non-traditional routines I have been experimenting with that have been yielding good results. The non traditional routine I will outline is something of a hybrid routine that attempts to utilize all of the energy pathways by varying rep ranges, volume, tempo, etc. without over emphasizing any one pathway.

Is this program superior to other training info and recommendations found in this e-book or other programs? I honestly have no idea. It's probably not the best routine if ultimate strength is the goal, but from a standpoint of body composition it will probably produce the best overall blend of hypertrophy and leanness when fine-tuned. To the best of my knowledge, no one has used such a program in this form, which could be described as a "best of all possible worlds" routine.

This is not a program for beginners, or a program for those already following another program they are deriving benefits from. People looking for a well-designed hypertrophy and strength oriented program need to look no further then Charles Poliquin's excellent chapter in this e-book. However, I believe it was Charles (or at least it's a quote often attributed to Charles) who once said "the best routine is the routine you are not doing right now." What he meant by that is, no matter how well thought out and designed the routine, the body quickly adapts to any program that does not change over time. Even the best programs will only work for so long before adaptation takes place and changes need to be made, be it changes in rep choices, changes in body part splits, changes in time between sets, changes in exercise choice, etc. Charles's program in this e-book does an excellent job of modulating all of these variables, so intermediate to advanced trainees can - and should - follow it. There are also many other well-designed programs by other competent coaches, many of whom are discussed on the forums.

Who is this program for? It's for people who have been training for a least a year and want to try something different, or something "non-traditional" vs. the more traditional programs or body part splits. It's for those who might have gotten mentally stale with what they are doing and really want to mix it up a bit. It's for those who need to really kick start their progress.

Don't underestimate the mental aspect here. Motivation is as important as anything you can affect in your quest to gain LBM and or lose fat. A program you approach with enthusiasm is always going to be more effective then the program you lack interest in, no matter how well-designed it is.

Finding ways of maintaining enthusiasm is half the battle. After 25 years of lifting weights, I know how important it is to maintain enthusiasm. Again, I don't know if this is the be all and end all program for hypertrophy, but I can tell you it's highly effective for altering body composition and will add a new level of interest and enthusiasm you may not have felt for a long time. It's also just downright fun. In a nutshell, it's an upper lower split that alternates with a hybrid HIIT day. That's the basics, here's the details of the program.

The body part split is divided into 3 distinct phases:

1. a strength oriented 5 x 5 rotated with a 6 x 6 core workout that focus on exercises known to use the most muscle and prime movers. Upper body day is a chest and back day only. Lower body day is thighs, hamstrings.

2. a hypertrophy-oriented program which consists of higher total volume and reps in the 8-12 range.

3. a whole body workout routine that also incorporates a hybrid cardio routine consisting of HIIT and conventional cardio.

The general sequence of the workouts looks like so:

The basic program looks like so:

- Core 5 x 5 (separate upper & lower days)
- Whole body hybrid HIIT
- Hypertrophy, (separate upper & lower days)
- Whole body Hybrid HIIT
- Core 6 x 6 (upper & lower days)
- Whole body hybrid HIIT
- Hypertrophy (separate upper & lower days)

Repeat, starting with the Core 5 x 5 routine.

The schedule is generally an every other day program, which would look like so and reflects the above macro program:

Monday	Core 5 x 5	Upper Body
Tuesday	Off	----
Wednesday	Core 5 x 5	Lower Body
Thursday	Off	----
Friday	Whole Body Hybrid/HIIT	----
Saturday	Off	----
Sunday	Hypertrophy	Upper Body
Monday	Off	----
Tuesday	Hypertrophy	Lower Body
Wednesday	Off	----
Thursday	Whole Body Hybrid/HIIT	----
Friday	Off	----
Saturday	Core 6 x 6	Upper Body
Sunday	Off	----
Monday	Core 6 x 6	Lower Body
Tuesday	Off	----
Wednesday	Whole Body Hybrid/HIIT	----
Thursday	Off	----
Friday	Hypertrophy	Upper Body
Saturday	Off	----
Sunday	Hypertrophy	Lower Body
Monday	Off	----
Tuesday	Whole Body Hybrid/HIIT	----
Wednesday	Off	----

Repeat cycle starting with Core 5 x 5.

However, some people may find a frequency - such as what follows below - is more effective for altering body composition:

Monday	Core 5 x 5	Upper Body
Tuesday	Core 5 x 5	Lower Body

Wednesday	Whole Body Hybrid HIIT	----
Thursday	Hypertrophy	Upper Body
Friday	Hypertrophy	Lower Body
Saturday	Whole Body Hybrid/HIIT	----
Sunday	Off	----
Monday	Core 6 x 6	Upper Body
Tuesday	Core 6 x 6	Lower Body
Wednesday	Whole Body Hybrid HIIT	----
Thursday	Hypertrophy	Upper Body
Friday	Hypertrophy	Lower Body
Saturday	Whole Body Hybrid HIIT	----
Sunday	Off	----

Repeat cycle starting with Core 5 x 5.

This frequency allows 6 workouts per week and may be superior for altering body comp, although it probably won't be as good as the every-other-day schedule for increases in sheer strength. There is no right or wrong frequency here per se, only what is right for the person following it. If you are a young guy or gal in your 20s, get plenty of sleep, eat properly, don't add a lot of outside activities/sports, the second frequency option may be optimal for you. However, if say you are in your 40s, like to play basketball a few times a week, miss a meal or two due to hectic work schedules, etc. then the every other day program might be best for you.

What I can say is, I personally prefer the every other day frequency and would quickly overtrain on the 6 day per week schedule. None of this is written in stone, of course. One could easily combine the two, or do one for 12 weeks followed by the other for 12 weeks and see which works best.

Rest periods between sets:

5 minutes for 5 x 5 Core
3 minutes for 6 x 6 Core
1 minute or less for Hypertrophy

Upper/Lower Core Workouts

Exercises for upper body day for Core workout (5 x 5 or 6 x 6) phase:

Chest	Back
Flat Bench Press	Deadlifts
Flat Dumbbell Press	Partial Rep Deadlifts (in a cage)
Incline Bench Press	Bent Over Rows
Incline Dumbbell Press	Cable Rows
Decline Bench Press	Weighted Chin Ups (various grips)
Decline Dumbbell Press	One-Arm Dumbbell Rows
Weighted Dips	Corner Rows

Exercises for Core lower body workouts:

Quads	Hamstrings
Back Squats	Barbell Straight Leg Deadlifts
Front Squats	Dumbbell Straight Leg Deadlifts
Leg Press	Lying Leg Curl
	Upright Leg Curl

Example of an upper body 5 x 5 core workout (80% - 85% of 1 RM):

- Flat Bench Press: 5 x 5
- Deadlifts: 5 x 5

Example of an lower body 5 x 5 core workout (80% - 85% of 1 RM):

- Squats: 5 x 5
- Straight Leg Deadlifts: 5 x 5

Example of an upper body 6 x 6 core workout (80% of 1 RM):

- Flat Bench Press: 3 x 6
- Incline Dumbbell Press: 3 x 6
- Deadlifts: 3 x 6
- Weighted Chins: 3 x 6

Example of a lower body 6 x 6 core workout (80% of 1 RM)

- Squats 6 x 6, super set with
- Straight leg dead lift 6 x 6

Or

- Squats 3 x 6
- Leg press 3 x 6
- Straight leg dead lift 3 x 6
- Leg curls 3 x 6

(super set squats, leg curls and straight leg deadlifts with leg presses)

Rest periods between sets:

- 5 minutes for 5 x 5
- 3 minutes for 6 x 6

Set order:

- 5 x 5 is done in straight sets: For example, 5 sets of squats followed by 5 sets of straight leg dead lifts.

- 6 x 6 is done as antagonist paired super sets. So, using the example of the 6 x 6 based workout above, you would super set flat bench press with dead lifts followed by incline dumbbell presses with weighted chin ups.

Upper/Lower Hypertrophy-Oriented Workouts

Hypertrophy oriented routines generally have higher volume, higher reps, and include some shoulder and arm work on upper body day and calves on lower body day. Reps are kept in the 8-12 range. The hypertrophy routine is set up like so:

Upper Body

- 8 sets for chest and back
- 4 sets for shoulders

- 3 sets for biceps
- 3 sets for triceps

Lower Body

- 8 sets for quads
- 8 sets for hamstrings
- 6 sets for calves

Rest period between sets: 1 minute or less**.**

For upper and lower body hypertrophy phase, the choices are wider. In addition to the choices from the Core workouts, exercises include:

Chest	Back
Flat or Incline Flyes Cable Crossover Cross Bench Dumbbell Pullovers Various Chest Machines (Hammer Strength Presses; Pec Deck, etc.)	Various Machines (Cable Lat Pull-down; Hammer Strength Row; Corner Row, Bent Row etc.) Cable Rows
Biceps	**Triceps**
Seated Alternating Dumbbell Curls Standing Barbell Curls Dumbbell Hammer Curls Various Curl Machines	Close Grip Bench Press Cable Push Downs Lying Extensions (Skull Crushers) Seated Overhead Extensions w/ dumbbells or barbells Various Machines
Shoulders	**Legs**
Seated Dumbbell Presses Seated Barbell Presses Dumbbell Side Laterals Bent Laterals Upright Rows Various Machines (Hammer Press; Smith Machine, etc.)	Lunges Hack Squat Leg Extensions Various Machines for quads and hamstrings

Example of Hypertrophy Workout: Upper Body	
Chest:	
Incline Dumbbell Press	3 sets
Hammer Machine Flat Press	3 sets
Weighted Dips	2 sets
Back:	
Chin Ups	3 sets
Hammer Machine Row	3 sets
Partial Rep Deadlifts in Power Cage	2 sets
Shoulders:	
Seated Dumbbell Press	2 sets
Side Laterals	2 sets
Biceps:	
Standing Barbell Curls	3 sets
Triceps:	
Skull Crushers	3 sets

Example of Hypertrophy Workout: Lower Body	
Quads:	
Front Squats	3 sets
Hack Squats	3 sets
Leg Extensions	2 sets
Hamstrings:	
Straight Leg Deadlifts	4 sets
Leg Curl	4 sets
Calves:	
Standing Calf Raises	3 sets
Seated Calf Raises	3 sets

Whole Body Hybrid HIIT Workout

I call it a "hybrid HIIT" day due to a whole body circuit is inserted in the middle of the HIIT routine.

The general structure is:

- Approx 15 - 20 minutes HIIT using treadmill
- Whole body circuit routine, 3 sets of 15 reps.
- Low intensity aerobics 20 minutes (optional) using stair stepper machine, stationary bike, etc.

There are various ways to perform HIIT, which stands for High Intensity Interval Training. HIIT-style training has many benefits and advantages. I am not going to spend much space covering the effects of HIIT type training, other then to say it has many metabolic advantages over traditional cardio.

HIIT should be considered an advanced option, for people with already good cardiovascular conditioning capable of exercising at 85% or above their maximal heart rate for brief periods of time. As stated in the beginning of this section, this is not a beginner's routine and a fairly high level of conditioning is required to successfully follow all the components of this program.

There are a number of different approaches to high intensity cardio training which combine brief intervals of maximal effort with short rest periods. You might, for example, combine 30 seconds of sprinting with 30 seconds of slow jogging, starting at 5 minutes, and working up to 15 minutes. Another version that yields a similar training effect is to perform 440 meter (approx. 1/4 mile) sprints, followed by 60 – 90 second rest periods.

My own version of HIIT is slightly different then the above and my gym does not have a track either. I use the treadmill, and will generally walk at a medium pace for 5 minutes, then run for 1 minute, and repeat 3 times, which takes a tad under 20 minutes, which is considered the maximum amount of time for HIIT training. You can use any of the above variations to HIIT or make up your own, but follow the guidelines that make HIIT productive.

OK, back to the HIIT day routine.

You will do your HIIT as outlined above, followed by a whole body circuit consisting of: squats, bench press, and chin ups (or pull downs if you can't complete the required reps of chin ups). One circuit consists of 15 reps each:

- Squats
- chin ups/pull downs
- bench press

Repeat circuit 2 more times.

There are essentially no rest periods between exercises during the circuit other then the time it takes to get from exercise to exercise. Rest periods between circuits are 1 minute or less.

You can also mix up the exercise choices for these circuits, but as a rule, they should be exercises from the Core routines which use the most muscle mass. A circuit of front squats, dumbbell presses, and bent over rows would work fine also. However, this phase really does not require much thought or changes to be effective and I rarely change from the squat, chin, bench circuit myself.

Finally, the hole Body Hybrid HIIT day is finished off with approx 20 minutes of low intensity aerobics as mentioned above. The entire routine takes an hour, give or take 10 minutes.

Conclusion

Well that's my recommended non-traditional routine. I suggest people follow it for 12 weeks then take 5-7 days off, then repeat. People who have been training a while should see some new progress in both conditioning and body composition they have not seen in some years. That's been my experience and the experience of the people I have given the program to try. I have refined it and tweaked it over time to cover just about everything I can think of. If one wants it to be slightly more fat loss oriented, you can add low intensity aerobics on two of the scheduled off days. 30-40 minutes on the treadmill or stationary bike should do it. However, be aware this increases the potential for over training. Done correctly, this is a taxing and demanding program. Don't say I didn't warn you!

To discuss Hybrid Training further, you can post in the Members' Area.

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We have pre-written forms for the workouts contained in the e-book for you to download and use. There are also blank forms you can use to write your own workouts.

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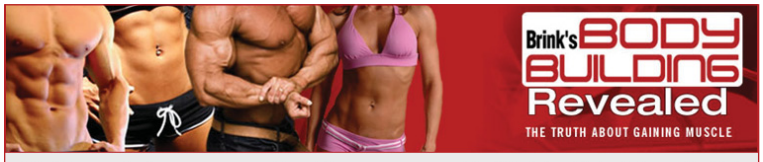
Brink's BODY BUILDING Revealed — Workout Log Sheet: 4-Day Upper/Lower Split

Exercise (Upper):	12/1/06					12/5/06				
Barbell Bent Rows	10/105#	8/115#	6/125#			10/110#	8/120#	6/130#		
Weighted Chin Ups	10/bw	8/+25#	6/+35#			10/bw	8/+30#	6/+35#		
Partial Rep Deadlifts	10/220#	8/240#				10/225#	8/245#			
Flat Bench Press	10/200#	8/220#	6/240#			10/205#	8/225#	6/245#		
Incline Dumbbell Press	10/120#	8/130#	6/140#			10/125#	8/135#	6/145#		
Weighted Dips	10/+25#	8/+35#				10/+30#	8/+35#			
Military Presses	15/120#	15/120#				15/125#	15/125#			
Side Laterals	15/60#	15/60#				15/65#	15/65#			
Straight Bar Curls	12/80#	10/85#	8/90#	6/95#		12/85#	10/90#	8/95#	6/100#	
Nose Breakers	12/85#	10/90#	8/95#	6/100#		12/90#	10/95#	8/100#	6/105#	
Exercise (Lower):	12/3/06					12/6/06				
Barbell Squats	8/280#	8/300#	6/315#	6/325#	6/335#	8/285#	8/305#	6/320#	6/330#	6/340#
Leg Extensions	10/200#	8/210#				10/205#	8/215#			
Straight Leg Deadlift	10/375#	8/395#	6/415#	6/420#		10/380#	8/400#	6/420#	6/425#	
Upright Leg Curl	10/160#	8/170#	6/180#			10/165#	8/175#	6/185#		
Standing Calf Raises	15/200#	15/200#				15/205#	15/205#			
Seated Calf Raises	15/240#	15/240#				15/245#	15/245#			

Downloadable Sample Diet Charts

Need help setting up your muscle-building diet? Prewritten sample charts for 1500 - 6000 calories/day are available to download and use as guides.



Meal #	Amt.	Food Item	Protein (g)	Carbs (g)	Fat (g)
Meal 1	1 1/2 c.	cooked oatmeal	9.0	39.0	3.0
	4 oz.	nonfat milk	4.0	6.0	0.0
	1 scoop	Precision Protein	20.0	2.0	1.0
	1 each	medium banana	1.0	27.0	0.0
	1 tbsp.	flaxseed oil	0.0	0.0	14.0
		Meal 1 Totals:	**34.0**	**74.0**	**18.0**
Meal 2	1/2 c.	low fat (2%) cottage cheese	14.0	4.0	2.0
	1 c.	sliced strawberries	1.0	10.0	0.0
	1 c.	red grapes	1.0	16.0	0.0
	1/2 c.	fresh pineapple	0.5	10.0	0.0
	4 each	brown rice cakes	4.0	28.0	0.0
	2 tbsp.	peanut butter	10.0	4.0	16.0
		Meal 2 Totals:	**30.5**	**72.0**	**18.0**
Meal 3	2 oz.	julienne sliced turkey	14.0	0.0	1.0
	1 oz.	grated cheddar cheese	7.0	0.0	9.0
	4 c.	greenleaf lettuce	0.0	4.0	0.0
	8 each	cherry tomatoes	0.0	8.0	0.0
	1/2 c.	shredded carrot	0.5	6.0	0.0
	1 oz.	lite olive oil vinaigrette	0.0	3.0	7.0
	8 oz.	baked potato	6.4	48.0	0.0

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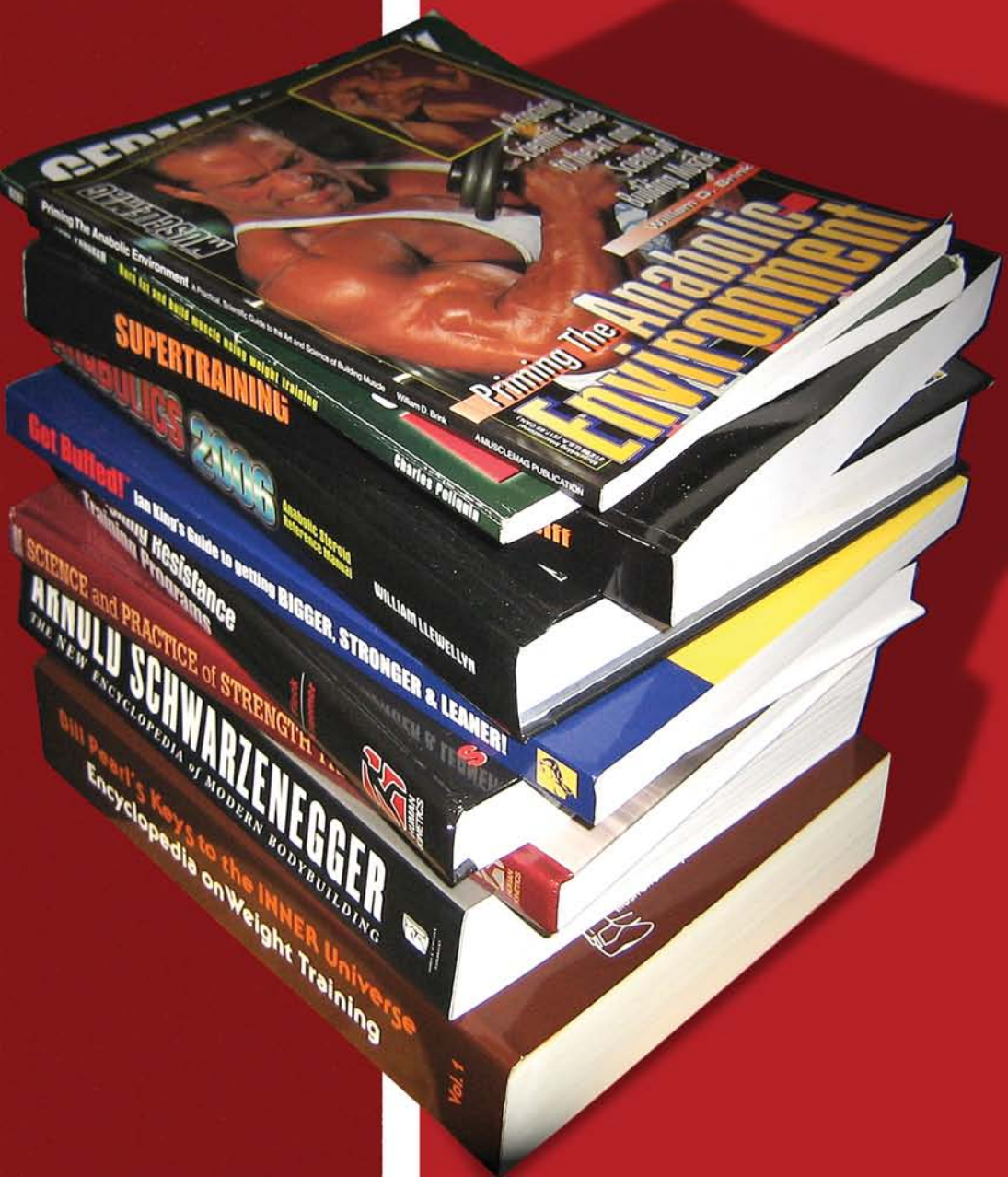
Appendix A

Brink's 100 Mass Gaining Foods

Appendix B

Glossary of Bodybuilding Terms



Brink´s Top 100 Mass-Gaining Foods

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One of the more positive aspects of eating for mass is the realization that you can eat foods that may contain a higher percentage of total calories from fat than you would like when your primary aim is losing body fat.

As explained in chapter 2, diets with a macronutrient split of 30% from fats, promote higher testosterone levels and accordingly higher levels of lean body mass.

Back in Chapter 3, I provided a several lists of foods to go into your shopping cart. You won't be surprised to find that there's a certain amount of overlap between those lists and this one. There's a difference too. The Chapter 3 lists are based on the foods you should eat for optimal health and well being. On a list like that, high fiber, low calorie foods like broccoli or spinach figure just as prominently as protein sources such as salmon or top round. But when it comes to gaining mass, let's face it: you can't get there without basing your meals around calorie - as well as nutrient - dense foods. It takes food energy to build lean body mass - it's that simple.

So this list is about the foods at the bottom of my pyramid. It doesn't mean that you shouldn't include spinach or broccoli in your meals - you should. But they aren't going to be the primary source of calories, protein, carbs and fats in your diet. The foods in this list are.

This extra report lists my top 100 mass gaining foods that are suitable for following this program. You'll notice that the list is relatively varied, for instance I do not believe bodybuilding fare need to be limited to tuna, chicken breasts and brown rice. Please note that this list is far from conclusive, if your tastes run to a slab of prime topside beef or rump, then by all means choose rump over my sirloin. As long as you check the nutrition labelling and it falls within the dietary guidelines, then you're welcome to swap my suggestion with one you may prefer.

Protein: Meat (cooked, trimmed of visible fat)						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Eye of Round Roast/Steak	3 1/2	100	163	30 g	0 g	4 g
Sirloin Tip Steak	3 1/2	100	168	29 g	0 g	5 g
Top Round Roast/Steak	3 1/2	100	209	36 g	0 g	6 g
Bottom Round Roast/Steak	3 1/2	100	164	28 g	0 g	5 g
Rib Eye Steak	3 1/2	100	182	30 g	0 g	6 g
Flank Steak	3 1/2	100	194	28 g	0 g	8 g
London Broil	3 1/2	100	166	28 g	0 g	5 g
96% Lean Ground Beef	3 1/2	100	150	25 g	0 g	4.5 g
Pork Tenderloin	3 1/2	100	187	30 g	0 g	6 g
Venison Steak	3 1/2	100	152	31 g	0 g	2 g
Rabbit (domesticated)	3 1/2	100	197	29 g	0 g	8 g
Buffalo Steak (top round)	3 1/2	100	171	28 g	0 g	6 g
Veal Leg (top round)	3 1/2	100	203	37 g	0 g	5 g
Veal Shoulder	3 1/2	100	164	26 g	0 g	6 g
Protein: Poultry (skinless, cooked)						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Chicken Breast, boneless	3 1/2	100	165	31 g	0 g	4 g
Turkey Breast	3 1/2	100	157	30 g	0 g	3 g
99% Lean Ground Turkey Breast	3 1/2	100	107	23 g	0 g	1 g
Ostrich (top loin)	3 1/2	100	155	28 g	0 g	4 g
Protein: Fish/Shellfish (cooked)						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Salmon (Atlantic)	3 1/2	100	182	25 g	0 g	8 g
Tuna (Yellowfin, fresh)	3 1/2	100	139	30 g	0 g	1 g
Tuna (canned in water, light)	3 1/2	100	116	26 g	0 g	1 g
Halibut	3 1/2	100	140	27 g	0 g	3 g
Sole	3 1/2	100	117	24 g	0 g	2 g
Red Snapper	3 1/2	100	128	26 g	0 g	3 g
Tilapia	3 1/2	100	128	26 g	0 g	3 g
Cod (Atlantic)	3 1/2	100	105	23 g	0 g	1 g

Protein: Fish/Shellfish (cooked) - continued						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Orange Roughy	3 1/2	100	105	23 g	0 g	1 g
Trout (Rainbow)	3 1/2	100	150	23 g	0 g	6 g
Mahi Mahi	3 1/2	100	90	20 g	0 g	1 g
Scallops	3 1/2	100	141	26 g	2.5 g	1 g
Shrimp/Prawn	3 1/2	100	99	21 g	0 g	1 g
Lobster	3 1/2	100	98	21 g	1 g	1 g
Crab	3 1/2	100	110	22 g	1 g	1 g
Protein: Dairy and Eggs						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Egg, whole (1 each)	1.8	50	71	6 g	0 g	5 g
Egg Whites (1 cup)	8.6	243	126	26 g	2 g	0 g
Cottage Cheese, nonfat (1 cup)	5.1	145	123	25 g	3 g	0.5 g
Cottage Cheese, 1% (1 cup)	8	226	163	28 g	6 g	2.5 g
Cottage Cheese, 2%	8	226	203	31 g	8 g	4.5 g
Whey Protein Concentrate	~ 1	30	110	23 g	2 g	1 g
Whey Protein Isolate	~ 1	30	100	27 g	1 g	1 g
Casein/Caseinates	~ 1	30	120	23 g	4 g	1 g
Fats: Nuts and Seeds (hulled)						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Almonds (unblanched)	1	28	169	6 g	5 g	15 g
Walnuts	1	28	185	4 g	4 g	18 g
Hazelnuts	1	28	177	4 g	5 g	17 g
Pistachios	1	28	157	6 g	8 g	13 g
Pecans	1	28	195	3 g	4 g	20 g
Brazil Nuts	1	28	185	4 g	3 g	19 g
Pine Nuts	1	28	178	3 g	5 g	17 g
Macadamias	1	28	203	2 g	4 g	21 g
Cashews	1	28	170	5 g	9 g	14 g
Peanuts	1	28	165	7 g	6 g	14 g
Flax Seeds	1	28	151	5 g	8 g	12 g

Fats: Nuts and Seeds (hulled) - continued						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Sunflower Seeds	1	28	164	5 g	7 g	14 g
Sesame Seeds	1	28	162	5 g	7 g	14 g
Pumpkin Seeds	1	28	153	7 g	5 g	13 g
Hemp Seeds	1	28	162	9 g	3 g	12 g
Peanut Butter (2 tbsp.)	~ 1	32	200	9 g	6 g	16 g
Almond Butter (2 tbsp.)	~ 1	32	202	4 g	6 g	18 g
Tahini (2 tbsp.)	~ 1	32	170	6 g	8 g	14 g
Fats: Oils and Other Foods						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Flax Oil (1 tbsp.)	0.5	14	126	0 g	0 g	14 g
Udo's Choice (1 tbsp.)	0.5	14	126	0 g	0 g	14 g
Fish Oil (1 tsp.)	0.17	5	45	0 g	0 g	5 g
Extra Virgin Olive Oil (1 tbsp.)	0.5	14	126	0 g	0 g	14 g
Avocados	0.5	14	126	0 g	0 g	14 g
Carbohydrates: Legumes/Grains/Starchy Vegetables (cooked)						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Lentils (1 cup)	7	198	226	18 g	39 g	1 g
Pinto Beans (1 cup)	6	171	245	15 g	45 g	1 g
Black Beans (1 cup)	6	172	227	15 g	41 g	1 g
Navy Beans (1 cup)	6.4	182	255	15 g	45 g	1 g
Kidney Beans (1 cup)	6.3	177	225	15 g	40 g	1 g
Adzuki Beans (1 cup)	8.1	230	294	17 g	57 g	0 g
Chickpeas (Garbanzos) (1 cup)	5.8	164	269	15 g	45 g	4 g
Great Northern Beans (1 cup)	6.3	177	209	15 g	37 g	1 g
Soybeans (1 cup)	6	172	298	29 g	17 g	15 g
Pink Beans (1 cup)	6	169	252	15 g	47 g	1 g
Black Eyed Peas (1 cup)	5.8	165	155	5 g	33 g	1 g
Split Peas (1 cup)	7	196	227	16 g	40 g	1 g
Rolled Oats (1 cup)	8.3	234	160	7 g	27 g	2.5 g
Steel Cut Oats (1 cup)	8.3	234	160	7 g	27 g	2.5 g

Carbohydrates: Legumes/Grains/Starchy Vegetables (cooked) - continued						
Food	wt. (oz)	wt. (g)	Kcal	Protein	Carbs	Fat
Oat Bran (1 cup)	7.7	219	145	7 g	25 g	2 g
Brown Rice (1 cup)	6.9	195	216	5 g	45 g	2 g
Quinoa (1/4 cup, raw)	1.5	42	160	6 g	29 g	3 g
Buckwheat (1 cup)	5.9	168	155	6 g	33 g	1 g
Bulgar (1 cup)	6.4	182	151	6 g	34 g	0 g
Wild Rice (1 cup)	5.8	164	166	7 g	35 g	1 g
Kamut (1/4 cup, raw)	1.6	46	140	6 g	32 g	1 g
Barley (1 cup)	5.5	157	193	4 g	44 g	1 g
Spelt (1/4 cup, raw)	1.6	45	130	5 g	33 g	1 g
Whole Wheat Pasta (1 cup)	4.9	140	174	7 g	37 g	1 g
100% Whole Grain Breads (1 slice)	1	28	70	4 g	12 g	1 g
Whole Grain Flour (1 cup, raw)	4.2	120	407	16 g	87 g	2 g
Sweet Potatoes/Yams (1 cup)	7.1	200	180	4 g	42 g	0 g
White Potatoes (1 each)	5.5	156	145	3 g	34 g	0 g
Corn, Sweet (1 cup)	7.4	209	166	5 g	41 g	1 g
Lima Beans (1 cup)	6	170	209	11.5 g	40 g	0.5 g
Jerusalem Artichokes (1 cup, raw)	5.3	150	114	3 g	26 g	0 g
Butternut Squash (1 cup)	7.2	205	96	3 g	22 g	0 g
Hubbard Squash (1 cup)	7.2	205	108	5 g	22 g	0 g
Pumpkin (1 cup)	8.6	245	49	2 g	12 g	0 g
Acorn Squash (1 cup)	7.2	205	115	2 g	30 g	0 g
Green Peas (1 cup)	8.9	253	197	13 g	36 g	0.5 g

Glossary of Bodybuilding Jargon & Slang

Return to T.O.C.

A

Abs, Abdominals

The muscles in the front of the stomach, giving the "six pack" look in people with sufficiently low body fat. Their function is to draw the base of the ribcage and the hips towards each other, as occurs when performing crunches . Note that conventional sit-ups are performed largely by the iliopsoas muscles

Abduction, Abductor

Abduction is movement away from the central axis of the body, an abductor is a muscle whose contraction results in this movement.

Acceleration

The rate of change in velocity. Can be applied to the speed at which you raise and lower a weight

Acclimatization

When the body gradual adapts to a changed environment, such as higher or lower temperatures.

Accommodating Resistance

Increasing resistance as lifter's force increases through range of motion. Nautilus machines are said to provide accommodating resistance.

Acetaminophen

A common over the counter analgesic (pain reliever) that is not a non-steroidal anti-inflammatory drug, sold under the brand name Tylenol®, and many others.

It may be used when a pain killer is desired which will not inhibit clotting

or produce gastric upset, though it will not provide any anti-inflammatory effects, nor may it be substituted for aspirin in the ECA stack.

Achilles Tendon
The tendon connecting the lower end of the calf muscle to the back of the heel

Acquired Ageing
The acquisition of characteristics commonly associated with ageing but that are, in fact, caused by immobility or sedentary living.

Acromegaly
One of the side effects attributed to excessive amounts of growth hormone. The condition is characterized by a thickening of the ends of the bones, particularly in the forehead and elbows.

Active Stretch
Muscles are stretched using the contraction of the opposing muscle, (antagonist). For an example stretching the triceps, requires the biceps to contract.

Adaptogens
Group of substances reputed to offer the body varying degrees of protection against internal and external stressors. Although slow to catch on in North America, athletes in the former Soviet Union have being using them for years.

Adduction, Adductor
Abduction is movement away from the central axis of the body, an abductor is a muscle whose contraction results in this movement.

Adductors, Thigh
Several muscles located in the upper part of the inner thigh whose function is to pull the legs towards the midline.

Adhesion
Fibrous patch holding muscles or other parts together that are normally separated.

Adrenoceptor
A receptor that responds to hormones (such as epinephrine (adrenaline)) produced by the adrenal gland

Aerobic
Prolonged, moderate-intensity work that uses up oxygen at or below the level at which your cardiorespiratory (heart-lung) system can replenish oxygen in the working muscles. Aerobic literally means with oxygen: running, cycling, swimming, dancing, and walking. Depending on how vigorously you play them, most racquet sports can also be aerobic exercise. It is the only type of exercise which burns body fat to meet its energy needs. Bodybuilders engage in aerobic workouts to develop additional cardiorespiratory fitness, as well as to burn off excess body fat to achieve peak contest muscularity.

Aerobic Capacity
Another term for maximal oxygen uptake (VO_2 Max)

Adipose Tissue
Tissue fat (body fat). May be subcutaneous (directly under the skin) or visceral (surrounding the internal organs, esp. in the abdominal area).

AFWB – American Federation Of Women Bodybuilders
Group that administers women's amateur bodybuilding in America.

Agonist
A chemical agent that stimulates, activates, accelerates, or enhances a process in the body compare antagonist

All Natural
Athletes, especially body builders who can avoid using steroids or other banned substances.

All-or-none
Muscle fiber contracts fully or it does not contract at all.

Amino Acids
Basic building blocks of protein

Anabolic/Anabolism
Relating to the phase of metabolism where simple substances are transformed or synthesized into complex materials of living tissue. Lifting weights at a high level of intensity triggers anabolism.

Anabolic Drugs/Anabolic Steroids
These are artificial male hormones that aid in nitrogen retention and thereby add to a male bodybuilder's muscle mass and strength. These drugs are not without undesirable side effects, however, and they are legally available only through a physician's prescription. Steroids are available in most gyms via the black market, although there can be serious legal penalties for both sellers and users.

Anaerobic
Exercise of much higher intensity than aerobic work, which uses up oxygen more quickly than the body can replenish it in the working muscles. Anaerobic exercise eventually builds up a significant oxygen debt that forces an athlete to terminate the exercise session rather quickly. Anaerobic exercise (the kind of exercise to which bodybuilding training belongs) burns up glycogen (muscle sugar) to supply its energy needs. Fast sprinting is a typical anaerobic form of exercise.

Anaerobic Threshold
The point at which you begin working your muscles without oxygen, from an aerobic level, believed to be at about 87% of your Maximum Heart Rate.

Androgenic
Producing or accentuating male sexual characteristics (body hair, deepened voice, male pattern baldness). One of the characteristics of steroids, whether synthesized in the lab or naturally in the body is their anabolic-androgenic ratio: if some amount of steroid X produces the same anabolic effects as a given amount of testosterone, how do the androgenic effects compare to those produced by that quantity of testosterone.

Antibiotic
Any group of chemical substances that destroy or inhibit the growth of bacteria; sometimes found in food as a contaminant.

Antioxidants
Vitamins A, C and E, along with various minerals, which are useful to protect the body from "free radicals". Free radicals are unstable cells, which react with each, naturally created in the body, and also caused by factors such as smoking and radiation. Free radicals may cause cell damage, which leads to disease.

APC
American Physique Committee, Inc. Group that administers men's amateur bodybuilding in America.

Aphrodisiac
A food or drink named after the love goddess Aphrodite, which is believed to arouse sexual desire.

Aquatics
Sports activities or exercise in or on water.

Arm Blaster
Aluminum or fiberglass strip about 5" x 24", supported at waist height by a strap around neck. Keeps elbows from moving while curling barbell or dumbbells or doing triceps pushdowns.

Aromatase
An enzyme responsible for (among other things) converting testosterone into estrogens

Arteriosclerosis
Hardening of the arteries due to conditions that cause the arterial walls to become thick, hard, and none elastic.

Aspartame
Artificial, non-caloric sweetener, generic name for Nutrasweet

Atherosclerosis
The deposition of materials along the arterial walls, a type of arteriosclerosis.

ATP/Adenosine Triphosphate:
The molecular "currency" that provides energy within cells for everything from protein synthesis to muscle contraction.

Atrophy
Withering away - decrease in size and functional ability of tissue or organs.

Avulse, Avulsion
Tearing away a body part or structure such as tearing a tendon or ligament off of a bone.

Analgesic
Tending to reduce or eliminate pain

B

Baby's Butt
Slang for Indentation between the two heads of biceps muscles of very muscular athlete.

Back-cycling
Cutting back on either number of sets, repetitions or amount of weight used during an exercise session.

Balance
A term referring to an even relationship of body proportions in a man's physique. Perfectly balanced phys-ical proportions are a much-sought-after trait among competitive bodybuilders.

Ballistic/Ballistic Stretch
Movement due to momentum rather than muscular control. Ballistic stretching involves "throwing" a body part in order to stretch a joint beyond the range of motion attainable through controlled muscular contraction such as when "bouncing" at the bottom of toe-touches. It is an effective technique for causing injury to connective tissue, which can reduce

flexibility rather than enhance it.

Barbell
A six or seven-foot bar that holds plates of different sizes and weights. This is the principle tool of strength training.

Basal Metabolic Rate/BMR
The rate at which the body burns calories while awake but at rest (usually measured in calories per day)

BBer
Slang for Bodybuilder

BCAAs/Branched Chain Amino Acids
The essential amino acids Leucine, Valine and Isoleucine. BCAAs - especially leucine - are important for reducing catabolism and promoting protein synthesis.

Benches
A wide variety of exercise benches is available for use in doing barbell and dumbbell exercise either lying or seated on a bench. The most common type of bench, a flat exercise bench, can be used for chest, shoulder, and arm movements. Incline and decline benches (which are angled at about 30-45 degrees) also allow movements for the chest, shoulders, and arms.

Bench Shirt
A very tight, sturdy shirt usually made from denim or neoprene theoretically worn for protection during bench press competitions whose main effect is to increase the amount of weight lifted by compressing and straightening the chest and arms.

Bent Row
An exercise for the lats and biceps. When performed using free weights, start with your waist bent so that your torso is parallel (or nearly parallel) to the ground; hold a barbell in both hands with your arms hanging downward. While keeping your torso in the same position, pull the barbell up to your stomach, then lower it until your arms are straight again and repeat.

Beta-Agonist
A beta-agonist or beta adrenoceptor agonist is a drug or chemical that partially mimics the effects of epinephrine, primarily targeting the beta adrenoceptors which accelerate heart rate and increase blood pressure (beta-1), dilate bronchial passages (beta-2), and release fatty acids from fat cells into the blood stream (all beta receptors). The most commonly encountered beta agonists are asthma drugs such as ephedrine and albuterol which target the beta-2 receptor.

Biceps Brachii/Biceps
The familiar "make a muscle" muscle that flexes the elbow joint. Additionally, the biceps supinates the forearm and helps raise the upper arm at the shoulder.

Biceps Femoris
The large, two-headed muscle on the back of the thigh. Contracting this muscle flexes the knee and also extends the hip (only one head of the muscle originates above the hip joint and contributes to this movement).

Biochemical Reaction
The chemical reactions which take place within the human body.

Bioavailability
The simplicity in which nutrients can be absorbed.

Biofeedback
This is a process that permits a person to see or hear indicators of physiological variables, such as blood pressure, skin temperature, or heart rate, which may allow the person to exert some control over those variables.

Biomechanics
Science concerned with the internal and external forces acting on a human body and the effects produced by these forces.

Bioimpedance
The resistance of a path through the body (typically measured between the feet and/or hands), most often used to estimate body fat percentages because fat conducts electricity more poorly than muscle.

Bitch Tits
A condition in which female-like breast development occurs in a male bodybuilder, also called gynecomastia.

Blocking Agents
General team used by athletes to describe any class of drugs or substances that prevent a banned substance from being detected in a drug test. In recent years, such agents have declined in popularity since most sports federations have added them to their list of banned substances.

Blood
Blood is a fluid that circulates through the heart, arteries, veins and capillaries. It's composed of red blood cells, white blood cells and blood platelets, and an interstitial fluid called plasma. The reddish color comes from the iron within the hemoglobin. Blood provide nutrition and oxygen for tissues, it also transport waste to the excretory organs. Blood also provides thermal and chemical regulation and helps in preventing infections by transporting antibodies.

Blood Doping
Blood doping is the process of injecting red blood cells to enhance the blood's oxygen carrying ability. Health risks include blood clotting, infections, transfusion reactions, and dangers of improperly transferred blood. Blood doping is banned in Olympic competitions.

BMI/Body Mass Index
Yet another way of approximating body composition for use in large-scale medical studies and for health reports to refer to in the popular press. This particular measure is calculated by dividing your mass in kilograms by the square of your height in meters. While such simplistic measures are useful for large statistical samples of the general population, their value is highly limited for individuals, particularly athletes who can be very healthy and have low bodyfat percentages despite having a higher-than-recommended BMI.

Board-lasted
Shoe construction featuring a piece of stiff fiberboard glued to the upper and then to the mid- and out-sole. These shoes offer a lot of stability and motion control, appropriate for the over-pronater. Learn how to choose running shoes.

Bodyfat, Bodyfat Percentage
The amount of fat in your body, generally expressed as a percentage.

Body Composition
The breakdown of your body make-up, i.e. fat, lean muscle, bone and water content, usually expressed in percentages.

Bone Density
Soundness of the bones within the body, low density can be a result of osteoporosis.

Box Squat
A variation on the squat performed with a bench, box, or other solid object under the lifter that stops the decent at the bottom. This can cause excessive compression of the spine and possibly lead to injury.

Brown Fat
A type of adipose tissue featuring cells with a greatly increased density of mitochondria and a much greater blood supply than ordinary "white" fat. Besides being able to store fat, brown fat cells can convert calories directly into heat through a process known as non-shivering thermogenesis. Brown fat is used by mammals to maintain body temperature and to expend excess calories that are consumed but not stored as fat.

Buffering Agents
Any group of substances used to reduce the acidity caused by the build-up of lactic acid during intense exercise.

Bulking Up
Gaining bodyweight by adding both fat & muscle, a once common practice no longer in vogue among knowledgeable bodybuilders.

Buffed
As in a "finely buffed finish" - good muscle size and definition, looking good.

Bulking Up
Gaining body weight by adding muscle, body fat or both.

Bump
Commonly done on many fitness forums, the practise of sending the thread to the top of the board for all to see. Newest replies are listed at the top.

Bumper Plate
A weight plate (almost always olympic) with a rubber outer rim to reduce damage to the floor (and the plate) in case it is dropped. These are most commonly used in olympic lifting where very heavy weights are lifted overhead

Burn
The burning sensation in a muscle that comes from the lactic acid and pH buildup resulting from exercising the muscle to failure.

Burnout
State of being bored or tired with exercise, frequently the result of over-training or unvaried workouts. Cross-training and rest are good remedies for burnout.

BV/Biological Value
The ratio (nitrogen retained)/(nitrogen consumed) for a single protein source consumed in relatively small quantity and without any other foods. For most athletes consuming reasonable diets, this is not an important factor.

Cable, Cable Machine
An exercise machine in which the lifter pulls on a handle attached to a cable. The main difference between an exercise in which the resistance is transmitted through a cable rather than being done with free weights is that the force is in the direction of the cable rather than always pointing downwards. For example, when using a cable machine to perform curls , the cable may continue to provide resistance at the top of the movement while the resistance the biceps must work against when lifting free weights is minimal when the forearm is at or near vertical.

Cadence
The beat, time or measure of rhythmic motion or activity such as pedaling a bicycle. Your cadence is the speed of your pedaling.

CAFB
The Canadian Amateur Federation of Bodybuilders, the sports federation responsible in Canada for ad-ministering amateur bodybuilding for men, women, and mixed pairs. The CAFB is one of the more than 120 national bodybuilding federations affiliated internation-ally with the IFBB.

Calipers
Tools for determining body fat percentage. Calipers are used to measure the thickness of various skinfolds, which are then plugged into equations to estimate body fat. The accuracy is highly dependent on the skill of the operator.

Calorie
A unit of energy, equal to the amount of energy needed to heat one gram of water one degree celsius. In common usage, the "calories" most often refer to kilocalories (also known as Kcal or "food calories") which are really 1000 calories.

Calorie beginning with a capital "C" is the common term for kilocalorie (kcal), while calorie with a lower case "c" is one thousand of a kilocalorie. One kilocalorie is the amount of energy needed to raise the temperature of a kilogram of water one-degree centigrade. It is the traditional unit repre-senting the energy value of nutrients.

On nutritional labels, the number of Calories per gram of protein, carbohy-drate and fat is calculated as follows:

1 gram of Carbohydrates gives 4 kcal
1 gram of Fat gives 9 kcal
1 gram of Protein gives 4 kcal

Calorie Balance
The difference between how many calories you eat (calorie intake) and how many you burn (calorie expenditure). When the calories you eat equal the calories you burn, you maintain your weight. Eating more calories than you burn results in weight gain. Burning more calories than you eat results

in weight loss.

Cam
Similar to a pulley , a cam normally has a cable attached to one point of the rim, an attached axle that transmits rotational force to or from another part of the machine, and a radius that varies with angle, changing the amount of force applied at different parts of the movement in a consistent manner.

Cambered Bar
A barbell with most of the middle offset; used to increase the range of motion in bench pressing and also very effective for avoiding scraped knees while deadlifting and for letting the arms hang straight down during shrugs.

Cannon-ball Delts
Slang for Shoulder as big as a cannon ball.

Capsaicin
The active chemical in hot peppers

Cap
The deltoid muscle of the shoulder, which can be divided into front, middle and rear heads for training

Carbohydrate
Digestible food components such as starches and sugars that are composed of carbon, hydrogen, and oxygen, but not nitrogen. Carbohydrates are the main constituent of most vegetables and fruits, provide four calories per gram, and are present only in small quantities in animal products.

Carbohydrate Loading
Increase consumption of carbohydrates in liquid or food form normally three days prior to an endurance type event.

Carb-Up
After any period of carbohydrate depletion, particularly as part of a cyclic ketogenic diet, the consumption of large quantities of carbohydrates with the intent of saturating muscle glycogen stores.

Cardiac Muscle
This is the type of muscle in the body that is only found in the heart.

Cardiac Output
The volume of blood pumped out by the heart in a given unit of time.

Cardio
Aerobic exercise mostly intended to expend calories and burn fat, and of course, strengthen the heart.

Cardiorespiratory Fitness
Physical fitness of the heart, circulatory system and lungs that is indicative of good aerobic fitness.

Cardiovascular Training
Physical conditioning that strengthens heart and blood vessels.

Carotid Pulse
Pulse located on the carotid artery down from the corner of the eye, just under the jawbone; common site used for taking heart rate.

Catabolic, Catabolism
Tending to break down tissue, muscle tissue in particular

Catheterization
An extreme method of passing a drug test whereby the athlete – usually male – injects "clean" urine into his bladder by way of a long thin hose called a catheter.

Cellulose
Indigestible fibre in foods.

Chalk Powder
Used on hands for secure grip.

Cheating, Cheat Reps
A cheat rep is a repetition performed by deviating from strict form (leaning, adding extra momentum at the bottom of the movement with whole-body motion) after a lifter has reached the point of failure with a given weight.

Chelating Agents
Soluble organic compounds that can fit certain metallic ions into their molecular structure.

Chinning Bar
A bar attached high on the wall or gym ceiling, on which you can do chins, hanging leg raises, and other movements for your upper body. A chinning bar is analogous to the high bar male gymnasts use in national and international competitions.

Cholesterol
A type of fat that, although most widely known as a "bad fat" implicated in promoting heart disease and stroke, is a vital component in the production of many hormones in the body. There are different types of cholesterol: namely, HDL and LDL (HDL being the "good" form and LDL being the "had" form).

Circadian Rhythm
Daily cycles of bodily function, commonly called the biological clock.

Circuit Training
Going quickly from one exercise apparatus to another and doing a prescribed number of exercises or time on each apparatus, keeps pulse rate high and promote overall fitness, by generally working all muscle groups as well as heart and lungs.

Citric Acid Cycle
A sequence of chemical reactions occurring within the mitochondria of living cells in which acetic acid (produced from foods) is oxidized to produce high-energy phosphate bonds (converting ADP to ATP) to be used to power the body's other metabolic processes. Also known as the citric acid cycle .

Clean
Lifting weight from floor to shoulder in one motion.

Clean Diet
This refers to eating nutrient-rich, low-fat meals.

Clean And Jerk
Olympic lift where weight is raised from floor to overhead in 2 movements (see also SNATCH).

Clean And Snatch
One of 2 Olympic lifts where weight is raised from floor to overhead at arms' length in one motion.

Cocktailing
Slang term used by athletes to refer to the practice of taking as many different performance-enhancing drugs as possible.

Collars, Weight Collars
Any kind of sleeve which may be slipped over the end of a weight bar after the plates have been put on and then tightened to hold the plates securely on the bar. This prevents plates from slipping off the end of the bar, shifting position, or rattling during the exercise. Olympic spin-lock collars typically weigh either 5 or 5.5 pounds each.

Compound, Compound Movement
An exercise that targets a more than muscle or muscle group simultaneously; usually the movement involves flexing or extending at least two joints.

Compound Training
Sometimes called "giant sets"; doing 3 - 4 exercises for same muscle, one after other, with minimal rest in between.

Concentration Curls
A type of bicep curl performed one-handed with a dumbbell , the torso leaning far forward and the elbow either directly below the shoulder or somewhat behind. Usually the upper arm is supported by the inner thigh of the lifter, though this is not required.

Concentric Contraction
Also called the "positive" movement. The contraction of a muscle against gravity, such as pressing a barbell upward during a bench press or pulling the lat bar downward during a pulldown.

Cool Down
Moderate then light activity, normally followed by stretching.

Coronary Circulation
Circulation of blood to the heart muscle associated with the blood carrying capacity of a specific vessel or development of collateral vessels (extra blood vessels).

CHD/Coronary Heart Disease
Diseases of the heart muscle and the blood vessels that supply it with oxygen, including heart attack.

Coronary Occlusion
The blocking of the coronary blood vessels.

Cramping
Exercising a muscle using shortened movements that causes a muscle to cramp, contracting painfully perhaps to the point of temporary fatigue to achieve a greater pump.

Creatine
A nitrogenous compound that when combined with phosphate in the muscle cell. Serves as a phosphate donor for the production of ATP. Creatine monohydrate is the most common supplemental form.

Crunches
An exercise performed by "curling" the midsection to draw the base of the rib cage and the hips as close together as possible; the hip joints themselves should not move during the movement and are usually held at a 90-degree angle by putting the lower legs on a chair or bench with one's back on the floor.

Cross-training
Engaging in a variety of physical activities and exercise modalities including both cardiovascular and strength training exercises; a training method that can be used to help minimize boredom, maintain motivation and prevent overuse syndrome.

Cutting Up/Cut Up/Cut
Stripping the body of excess body fat while retaining maximum muscularity. Also can be called Ripped, Shredded, Sliced, etc.

Curved Last
Shoe construction with a curved sole. This shape provides cushioning and promotes inward motion. Good for feet with rigid, high arches that underpronate. Learn how to choose running shoes.

Cycle
A length of time set aside for specific types of training, whether for bulking up, getting stronger, getting leaner, etc. Combining individual training cycles is sometimes referred to as periodization. Another meaning is taking one or more specialized supplements (or steroids) for a specific period of time, as taking creatine for two months, then stopping for a month.

Cyclic Ketogenic Diet/CKD
A ketogenic with the intentional addition of periodic "carb-ups" (as opposed to snapping and going berserk in a doughnut shop because you can't take it any more). The ketogenic periods typically last five days to a month or longer, carb-ups are usually only half a day to two days.

Dart
Slang term for syringes.

Dead Lift
One of three powerlifting events (other two are squat and bench press). Weight is lifted off floor to approximately waist height. Lifter must stand erect, shoulders back.

Deadlift Bar
A bar, usually but not necessarily straight, which is smooth in the center, but is knurled in the areas a lifter is likely to grip while performing a deadlift

Deficiency
A sub optimal level of one or more nutrients that are essential for good health, most often seen with vitamins. A deficiency can be caused by poor nutrition. increased bodily demands (especially from intense train-ing), or both.

Definition
Extremely low bodyfat coupled with superior muscle separation and vascularity; the physical manifestation of 'dialing it in'. Adjectives that are used to describe this desired state include ripped, shredded, sliced, cut, striated.

Deltoids/Delts
A triangular muscle that covers the shoulder joint and is used to raise the arm from the side.

Density
Muscle hardness, which is also related to muscular definition. A bodybuilder can be well-defined and still have excess fat within each major muscle complex. But when he has muscle density, even this intramuscular fat has been eliminated. A combination of muscle mass and muscle density is highly prized among all competitive bodybuilders.

Deoxyribonucleic Acid/DNA
The chemical, typically formed into chromosomes, that forms the chemical basis of genetics and heredity. Your DNA is what makes you a human (assuming that's what you are) and not a hamster (assuming you're not - it's hard to tell these things over the net)

Depression
In kinesiology this is an inferior movement of the shoulder girdle. For example when you return the weight to the normal start position in a shoulder shrug.

DEXA/ Dual-energy X-ray Absorptiometry
Non-invasive clinical technique for measuring body composition. Considered the "gold standard" due to its high degree of precision.

Dextrose
A simple sugar which is the main form of carbohydrate transported through

the bloodstream to be used for fuel by cells.

Diabetes
A chronic disease in which the body lacks the ability to metabolize sugar. An diabetic has to inject insulin (Type 1) or take medications (Type 2) in order to keep blood sugar levels stable.

Dihydrotestosterone/DHT
A highly androgenic hormone produced from testosterone by the enzyme 5-alpha-reductase. This hormone is the primary culprit in male pattern baldness and benign prostate enlargement

Distal
Farthest from the midline or a point. For example, the hand is the most distal part of the upper extremity.

Diet
Food and drink regularly consumed by a person, often according to specific guidelines to improve physical condition.

Dipping Bars
Parallel bars set high enough above the floor to allow you to do dips between them, leg raises for your abdominals, and a variety of other exercises. Some gyms have dipping bars which are angled inward at one end; these can be used when changing your grip width on dips.

Dialing It In
The process of training and dieting to get shredded for a contest. Adjectives include on time, on the money, peaking.

Dip Belt
A belt, usually without a buckle, with a chain or other method of attaching a weight as a simple and comfortable way of adding weight when performing exercises involving lifting one's own body. A dip belt is most commonly used when performing dips (go figure!) and chin-ups , though it can be an effective way of allowing the lifter to perform pull-downs without lifting oneself up into the air during the movement. .

Disease/illness Prevention
Altering lifestyles and environmental factors with the intent of preventing

or reducing the risk of various illnesses and diseases.

Disease/illness Treatment

Altering lifestyles and use of medical procedures to aid in rehabilitation or reduction in symptoms or debilitation from a disease or illness.

Diuretics

Sometimes called "water pills," these are drugs and herbal preparations that remove excess water from a bodybuilder's system just prior to a show, thereby reveal-ing greater muscular detail. Harsh chemical diuretics can be quite harmful to your health, particularly if they are used on a chronic basis. Two of the side effects of excessive chemical diuretic use are muscle cramps and heart ar-rhythmias (irregular heart beats).

DNP/Dinitrophenol, 2,4-dinitrophenol

A potent nonselective uncoupler of oxidative phosphorylation that is not only effective when ingested, but can also be absorbed through the skin. It is used industrially as a wood preservative, in the production of explosives, and as an ingredient in insecticides. It is extremely flammable or explosive when dry.

Its use as a weight loss aid dates back to the 1920s, but side effects such as lethargy, malaise, death, and bad breath soon caused the medical establishment to discontinue its use. Reintroduced to the public as a weight loss technique by the late Dan Duchaine, the small therapeutic range (the difference between the effective dose and the lethal dose) and serious side effects have continued to discourage its use.

DOMS

Recently popularized acronym for Delayed Onset Muscular Soreness, the phenomena of muscle soreness from sport or exercise afflicting the body a day or two after performance. Causes and desirability are subject to discussion.

Double (Split Training) Routine

Working out twice a day to allow for shorter, more intense workouts. Usually performed by advanced bodybuilders preparing for contests.

Downregulation

Decreasing the activity or responsiveness of a physiological process by re-

ducing the number of available receptors

Drying Out
Encouraging loss of body fluids by limiting fluid intake, eliminating salt, sweating heavily and/or using diuretics.

Dumbbell
A short bar with fixed or changeable weights mounted on each end with enough space in between to grip with one hand.

The term "dumbbell" comes from the practice of demonstrating strength by lifting heavy cast metal bells (like the Liberty Bell, only smaller and not cracked). A "dumb bell" was a bell made without a clapper so that it would not ring through one's show of physical prowess. Eventually, any weight meant to be hefted with one hand was referred to as a "dumbbell" and after what we now think of as being a dumbbell shape became standard, the word "bar bell" or "barbell" was coined to refer to a similar weight with a central bar long enough to be held easily with two hands.

E

Easy Set
Exercise not close to maximum effort, as in a warm-up.

EC, ECA Stack
Ephedrine, Caffeine, and Aspirin, a popular and effective thermogenic combination of drugs used for weight loss and energy. Ephedrine is a stimulant that acts to increase alertness, energy, and body temperature, thus increasing caloric expenditure.

Caffeine inhibits the body's natural tendency to counteract the stimulant effects of ephedrine, so that the two of them used together increase caloric expenditures more than the sum of the increases caused by each one used individually.

The most common dosage is 200 mg of caffeine taken with 20 mg of ephedrine three times per day, the third dose being taken not later than

dinnertime.

Caffeine and ephedrine act as appetite suppressants, which has weight-loss benefits as well. 60 mg of aspirin (about a quarter of a standard aspirin tablet) is often added to the stack, but studies have not shown conclusively that ECA is more effective for weight loss than ephedrine and caffeine without aspirin.

Please note that ephedrine and caffeine also have a diuretic effect, so some weight loss will be due to a loss of water and not fat.

Eccentric Contraction
Also called the "negative" movement, it's the lengthening of a muscle while under tension, such as lowering a barbell during a bench press or a barbell curl.

Ectomorph
Thin and linear body type

Electrostimulations
This process involves the stimulation of the muscle, where by, a technique involving the use of a low-voltage electric current is used.

Electrolytes
Minerals such as sodium, potassium, magnesium, and calcium used by cells in the creation and elimination of membrane potentials used to propagate nerve impulses and muscular contraction

Elevation
In kinesiology this is an superior movement of the shoulder girdle. For example as in shrugging the shoulders.

Endocrine
Glands that produce chemicals released into the bloodstream. The pituitary and adrenal glands are endocrine glands; salivary glands and sweat glands are not.

Endogenous
Produced naturally within the body.

Endomorph
Rounded body type with small shoulders.

Endorphins
Any of a group of proteins with potent analgesic properties that occur naturally in the brain. These are the brain chemicals that contribute to the "runner's high" or good feelings during and after exercise.

Endurance
Ability of a muscle to produce force continually over a period of time.

Enzyme
A protein catalyst; enzymes are involved in digestion and both the synthesis and breakdown of proteins, hormones, and other substances in the body.

Ephedra
An herb, also known as Ma Huang and "Mormon Tea" containing ephedrine and pseudoephedrine.

Ephedrine
A common beta agonist used to relieve the symptoms of asthma; it dilates bronchial passages and is also a stimulant. Compare pseudoephedrine.

Epinephrine
Also known as adrenaline, epinephrine is a sympathomimetic hormone produced by the adrenal glands that accelerates heart rate, constricts blood vessels, raises blood pressure, dilates breathing passages, and accelerates the peristaltic motion of the muscles lining the intestines.

Epiphyseal Plates
The "plate" on the end of a bone, particularly the long bones of the arm and leg which remain unfused to the rest of the bone during growth. Once they become fused, these bones cease to grow longer.

EPOC - Excess Post-Exercise Oxygen Consumption
Refers to the continued elevated (above resting) amount of calories being burned due to recovery from exercise. During recovery, calories are burned during muscle and tissue repair and oxygen replacement in muscles.

Ergogenic Aids
Tending to increase muscular power, endurance, or size

Essential Amino Acids
Amino acids which cannot be synthesized by the body from other amino acids and, thus, must be present in the diet: leucine, isoleucine, lysine, methionine, phenylalanine, tryptophan, threonine and valine

Essential Fatty Acids
Unsaturated fatty acids which cannot be synthesized by the body and are used as the starting point for the biosynthesis of necessary metabolic and hormonal chemicals.

Estrogen, Estrogenic
There is no one hormone named "estrogen"; estrogens are hormones that induce or accentuate female sexual characteristics (as well as performing other functions, depending on the specific hormone).

Estrogens include estrone, progesterone, and estradiol. "estrogenic" means "tending to induce the same effects that estrogen does"; while chemicals that mimic testosterone are almost nonexistent in nature, our food supply, and our environment, estrogenic chemicals are common.

Some of these, such as genistein (found in soy) have gotten considerable press coverage because they are weak estrogens, meaning

that while they can occupy an estrogen receptor , they do not stimulate the receptor to as great an extent as the body's own estrogens would, which can reduce one's risk of estrogen-related cancers and tumors, most notably breast cancer.

However, for this last effect to occur, the weak estrogens must be present in the body in sufficient quantity so that they displace existing natural estrogens that would otherwise stimulate available estrogen receptors--and the total degree of stimulation produced by the greater number of occupied receptors must be less than would have been produced by the naturally present estrogens alone.

Other estrogenic chemicals are found in plastics and pesticides and exert harmful developmental effects by disrupting the normal hormonal events

that take place in humans and animals.

Extracellular
Outside the cell or cells (in the bloodstream, lymph, etc.) as opposed to inside.

Extension
The act of straightening a joint

EZ-Curl Bar
A short barbell with a shaft bent like a stretched-out 'w' typically used for performing curls with the hands turned inward more than they would be using a straight bar, putting less strain on the wrists. A typical olympic EZ-curl bar weighs around twenty pounds, though there's no "official" standard weight. Standard (takes plates with 1" holes) versions would be lighter, typically ten to fifteen pounds.

F

Failure
That point in an exercise at which you have so fully fatigued your working muscles that they can no longer complete an additional repetition of a movement with strict biomechanics. You should always take your post-warm-up sets at least to the point of momentary muscular failure, and frequently past that point.

Farmer's Walk
Grab a weight in each hand--dumbbells will work fine in you don't have a pair of large milk pails--and walk. Keep walking, carrying the weights until your hands, shoulders, or some other body part is crying for mercy.

Fartlek
Swedish for "speed play," a type of loosely structured interval training for runners, cyclists, and in-line skaters. It combines high-intensity segments with your regular training pace in order to build strength and speed.

Fascia
Fibrous connective tissue that covers, supports and separates muscles and muscle groups. It also unites skin with underlying tissue.

Fast-twitch
Refers to muscle cells that fire quickly and are utilized in anaerobic activities like sprinting and powerlifting.

Fat
Digestible food components such as butter, lard, and oils composed of fatty acids. All kinds of fats provide nine calories per gram.

Feedback Control
Process by which the body's hormonal systems monitor their own levels of circulating hormones.

Femur
Tthe bone of the thigh.

Fiber
An indigestible component of food, chemically classified as carbohydrates (and may be included in the total carbohydrate content listed on food labels), found primarily in unprocessed vegetables, nuts, grains, and fruits. Fiber does not provide calories, but offers significant health benefits as a component of the diet.

Fibrin
The substance that in combination with blood cells forms a blood clot.

Fibula
The smaller bone of the lower leg

Flat
Describes muscles that have lost their fullness, commonly caused by overtraining, undertraining or a lack of nutrients and water.

Flax Seed Oil
An oil rich in omega-3 polyunsaturated fatty acids; because of the high

polyunsaturated fatty acid content, it should be kept refrigerated and even then has a limited shelf life.

Flex
Bend or decrease angle of a joint; contract a muscle.

Flexion
Bending in contrast to extending, as in leg flexions.

Flexibility
A suppleness of joints, muscle masses, and connective tissues which lets you move your limbs over an exaggerated range of motion, a valuable quality in bodybuilding training, since it promotes optimum physical development.

Flow
A training term referring to the smooth, continuous movement from exercise to exercise without interruption in focus and action.

Flyes
An exercise targeting the pectoral muscles usually performed by lying face-up on a bench with arms almost straight (don't lock out your elbows, just keep the elbow joint at the same angle through the movement and move only the your shoulder joint) and a dumbbell in each hand. Raise the weights slowly until they are directly above your chest, lower them back out to the sides; repeat.

Forced Reps
Extra repetitions of an exercise assisted by a spotter who bears some of the weight.

Focus
Concentration on all the aspects of the work before you: muscles involved, the track they follow, the intensity of exertion, burn and pump, and signals of fatigue, injury or abuse. Concentration is extended to the weight used, technique applied, attitude, thirst, surrounding atmosphere, equipment and so on. Full-time job of primary importance.

Form
This is simply another word to indicate the biome-chanics used during the performance of any bodybuild-ing or weight-training movement. Perfect form involves moving only the muscles specified in an exercise description.

Freak
Anyone with inhuman size or disproportional muscles. The person that makes you stare.

Free Hand Movement
Any exercise that can be performed without exercise equipment, using only your body weight, such as a push-up or squat without weight.

Free Radicals
Electrically charged particles produced during cellular respiration. Although not fully understood, it is believed a build-up of free radicals leads to a gradual decline in health (known as aging).

Free Style Training
Training all body parts in one workout.

Free Weights
Barbells, dumbbells, and related equipment. Serious bodybuilders use a combination of free weights and such exercise machines as those manufactured by Nautilus and Universal Gyms, but they primarily use free weights in their workouts.

Frequent Feeding
Eating often throughout the day to work with your body, not against it. fly eating at regular intervals throughout the day (approximately every two to three hours), you can keep your metabolism elevated and energy levels stable.

Flush (1)
To increase the blood supply to a muscle, thereby bringing in more nutrients.

Flush (2)
Cleanse a muscle by increasing the blood supply to it, removing toxins left in muscle by exertion.

Front Squat
Squats done with the bar placed across the front of the shoulders rather than across the back. This concentrates the exercise more on the quadriceps and less on the back and glutes. Usually less weight can be lifted this way than when performing a conventional squat.

Fructose
Also known as "fruit sugar" even though it is found in many foods besides fruit and it is not the majority of the sugar content in most fruits. Fructose also forms half of the sucrose (ordinary table sugar) molecule. Approximately 50 grams of fructose per day can be metabolized by the liver into glucose; amounts consumed beyond that will be converted into triglycerides using an alternate pathway.

Full
The appearance of muscle pressing against skin. The best competitive bodybuilders manage to look simultaneous full and shredded.

Gaspari Bar
A short weight bar with rotating handles mounted in-line with the bar so that they are free to rotate. Generally used for bicep curls , the Gaspari bar allows the lifter's hands to rotate freely.

Gastrocnemius
The superficial (on top) head of the calf muscle which together with the soleus (the other head of the calf muscle) attaches to the heel through the achilles tendon and to the femur just above the knee joint.
compare soleus

Gear
Slang For steroids, syringes, anything associated with the use of steroids

German Volume Training/GVT
A training technique in which ten sets of ten reps are performed for each exercise. The same weight is used for each set and rest periods between sets are kept to a minimum.

Giant Sets
Series of 4-6 exercises done with little or no rest between movements and a rest interval of 3-4 minutes between giant sets. You can perform giant sets for either two antagonistic muscle groups or a single body part.

Glucagon
A hormone responsible for the regulation of blood sugar levels.

Glucose
Also known as dextrose , a simple sugar which is the main form of carbohydrate transported through the bloodstream to be used for fuel by cells.

Glutamine
The most abundant amino acid in muscle tissue. Has been shown to have anabolic and anti catabolic effects.

Gluten
Gluten is manufactured by removing the starch from wheat.

Glutes/Gluteus Maximus
The group of the three large muscles of each buttock that extend, abduct and rotate the thigh.

Glycemic Index
Glycemic Index (GI) is a rating system for carbohydrates that deals with how quickly the sugar enters the blood stream and the extent of the insulin response following that entry. GIs were initially established to help diabetics regulate insulin levels following meals. Those carb sources that have low GIs generally enter the blood stream slower or cause a smaller insulin response. This can be beneficial for those trying to lose fat as well as those who are diabetic.

Glycerol
When our digestive system brakes down fats it changes into glycerol; also called glycerin.

Glycogen
A type of starch synthesized from glucose for intracellular storage. The primary glycogen stores are in the liver and in the muscles; liver glycogen stores will be broken down to glucose and released into the bloodstream when blood sugar levels are low, whereas this does not happen with muscle glycogen stores which will be used only to provide fuel for the muscles themselves.

Note that way that glycogen is stored in the body requires four grams of water to be stored for each gram of glycogen. The combined weight and volume of muscle glycogen stores accounts for a significant part of total muscular size.

Good Mornings
A lower back exercise that's performed by putting a barbell across your shoulders as if you were doing a squat, but instead of bending at the knees, keep your knees in a slightly bent position throughout the movement and bend only at the waist until your torso is close to horizontal, then raise your torso back to the vertical position.

Gorging
This refers to eating large amounts of food at one meal, then waiting for many hours, maybe a full day, before eating again. This is also known as bingeing.

Gram
The metric unit of mass
28.35 grams = 1 ounce
453 grams = 1 pound
28.349 grams = 1 ounce
1,000 mcg = 1 mg
1,000,000 mcg = 1 gram
1,000 grams 1 kilogram

Grazing
This term refers to frequent feedings - eating small amounts of food often.

Grip
Holding onto the bar (or other object); many exercises can be performed with multiple grip styles and the type of grip used will affect the amount of weight that can be used, the safety of the movement, and the muscles targeted.

Grip, False
A style of grip most commonly used in the bench press in which the thumb remains against the side of the palm rather than wrapping around the bar.

Grip, Neutral
lif your palms are facing towards each other you are using a neutral grip

Grip, Pronated
Look down at your hands; if your palms are facing away from you, you are using a pronated grip

Grip, Reverse
A reverse grip is one in which the wrists are rotated in opposite directions (one pronated, the other supinated). This is most commonly used for dead-lifts because the tendency of the bar to roll out of the hands is cancelled out, allowing the lifter to hold more weight.

Grip, Supinated
Look down at your hands; if your
palms are facing towards you, you are using a supinated grip

Growth Hormone
Peptide hormone secreted by the pituitary gland responsible for the repair and growth of tissues such as bones, muscles, and organs. In recent years, growth hormone has become one of the most popular agents used by pro-fessional bodybuilders.

Guarana
Guarana comes from the seed of a herb found in the Amazon in Brazil. It's a popular source of caffeine and has been known for long as a popular stimulant among the Brazilians.

Guns
Another word for Biceps, alone for with triceps. Other slang words include Pipes, Pythons...

Gynecomastia
Condition in males caused by an excess of testosterone or an excess of a testosterone-derived agent. When it becomes converted (aromatized) to estrogen the excess estrogen stimulates receptors in the nipple area leading to a swelling, which resembles female breasts. The condition is commonly called "bitch tits." The condition is often severe enough to warrant surgical removal.

H

Hammer Curl
A variation on the bicep curl in which a neutral grip is used throughout the movement, which transfers more force onto the brachioradialis by reducing the leverage of the biceps at the top of the movement.

Hams, Hamstrings
The large, two-headed muscle on the back of the thigh. Contracting this muscle flexes the knee and also extends the hip (only one head of the muscle originates above the hip joint and contributes to this movement).

Hand Off
Assistance in getting a weight to starting position for an exercise.

Hardbody
Women who are so toned, so good looking, with excellent physique. Top of the line fitness competitors.

Hard Set
Perform a prescribed number of repetitions of an exercise using maximum effort.

HDL

This stands for "high-density lipoprotein." It's one of the subcategories of cholesterol--typically thought of as the "good" cholesterol. You may be able to raise your HDL cholesterol levels by ingesting qual-ity unsaturated fats like flaxseed oil. Exercise has ~so been shown to increase HDL levels.

Head, Muscle Head

Many muscles attach at a single point on one end and at multiple points at the other, somewhat like a bunch of bananas, but better at lifting big, heavy iron with. "biceps" means two heads; "triceps," three; "quadriceps," four. often the multiple heads of a single muscle will attach to different bones on either side of a joint. The calf muscle has two heads, which con-nect at the bottom and attach to the heel: the , the top of which attaches above the knee joint, and the soleus which attaches below.

HIIT

"High Intensity Interval Training" - not to be confused with HIT. HIIT is a form of cardiovascular exercise characterized by short intervals of maximal effort alternating with short periods of lower-intensity work.

HIT/High Intensity Training

This is a training method which believes in minimizing the sets per exer-cise. Each set is done at very high intensity to complete failure. A 'HIT Jedi' does not believe in split routines where different body parts are trained on different days (which allows more time per body part). Amongst other benefits, HIT training is a very time efficient way of training.

HMB/Hydroxymethylbutyrate

A metabolite of the branched-chain amino acid leucine, HMB is also avail-able in supplement form. Some studies have shown increased growth in cattle given HMB, but evidence of any value for increasing human muscle growth and athletic performance is limited.

Homeopathic

Traditionally, a philosophy of therapy in which medical conditions are treated by preparing a solution of a substance which produces symptoms similar to those produced by the condition, diluting it until no molecules of the active ingredient remain in the solution, and then drinking it. The term is often applied to any solution so prepared, and irrespective of whether the homeopathic solution is intended to cure or cause a particular reac-

tion, it is an expensive technique for consuming small quantities of water.

Homeostasis
T he maintenance of consistent internal body conditions. It is achieved by a series of negative-feedback control mechanisms. For example, when sensors detect overheating of the body, sweating is stimulated until the body temperature returns to normal.

Hydrogenated Fat
This is a fat that has been chemically altered by the addition of hydrogen atoms to the unsaturated fatty acids in the fat. Some vegetable oils and margarine are examples of products containing hydrogenated fats.
See also trans fatty acids.

Hyperextension, Hyperextensions
Of a joint, "hyperextension" refers to bending it beyond its normal range of motion (usually this is bad). as an exercise, "hyperextensions" are performed using a roman chair which supports one's legs and hips in a horizontal, prone position. Either with or without a weight, one then bends at the hips, lowering one's head and shoulders until ne's torso is close to vertical. Then, by contracting the glutes and spinal erectors , one raises one's torso back upwards to above the horizontal.

Hyperglycaemia
Abnormally high blood sugar level (high level of glucose in the blood). The term is used when the blood sugar value is exceeding 140 mg/dl.

Hyper Kinetic Condition
A disease/illness or health condition caused or contributed by excessive exercise.

Hyperplasia
Hyperplasia refers to an increase in the number of cells/fibers in a muscle.

Hypertension
High blood pressure.

Hyperthermia
Body temperatures exceeding normal.

Hypertrophy
The scientific term denoting an increase in muscle mass and an improvement in relative muscular strength. Hypertrophy is induced by placing an "over-load" on the working muscles with various training tech-niques during a bodybuilding workout

Hypoglycemia
The opposite of hyperglycaemia. This means low blood glucose level, or low blood sugar. This condition is usually a result of fasting.

IFBB – International Federation Of Bodybuilders.
Founded in 1946 the group that oversees world-wide men's and women's amateur and professional bodybuilding.

IGF-1
Insulin-like Growth Factor 1 is a polypeptide hormone with a sequence similar to insulin. IGF-1 production is stimulated by growth hormone. It's important for human growth and development but also has anabolic effects in adults.

Incomplete Proteins
Proteins which are low in one or more of the essential amino acids.

Insertion
The point of attachment of a muscle most distant from the body's midline or center.

Instinctive Training
Instinctive training is responsible for more confusion and misguidance than any other training myth. On this system you're supposed to train accordingly to how your body feels. Training with whatever weights and movements you feel like doing.

Insulin
A hormone that promotes the uptake of nutrients (most notably glucose)

Insulin Resistance
Areduced sensitivity to insulin, meaning that more insulin must be released to cause a given amount of nutrients uptake into the body's cells. Note that the downregulation of insulin sensitivity is likely to be more extreme in lean tissue than adipose tissue, so that persons who have developed a high degree of insulin resistance are likely to preferentially store nutrients as fat rather than use them for tissue growth and repair. Type-2 (adult onset) diabetes is an extreme form of insulin resistance.

Intensity
Used loosely as the degree of difficulty of a given exercise or workout. A measured amount of energy put forward to complete the exercise.

Intervals
Speed workouts, usually run on a track, with distances and target paces decided before you run. They typically consist of relatively short sprints of 220 yards to 1 mile interspersed with rest periods of slower running.

Intracellular
Iinside the cell or cells as opposed to outside (in the bloodstream, lymph, etc.)

In Vitro
Used to describe research that is performed using cell or tissue cultures rather than living animals or human beings.

In Vivo
Usually used to tell that it's a real-life situation - observing a patient's behavior in vivo. Also used when speaking of something in the living body of a plant or animal - microorganisms are not ordinarily destroyed in vivo by bacteriostatic drugs.

Isokinetic Exercise
Isotonic exercise in which there is accomodating resistance. Also refers to constant speed. Nautilus and Cybex are two types of isokinetic machines, where machine varies amount of resistance being lifted to match force

curve developed by the muscle.

Isolation Exercise/Isolation Movement

An exercise that targets a single muscle or muscle group; usually the movement involves flexing or extending only one joint.
curls, leg extensions, and flyes are isolation movements, lat pulldowns, squats, and bench presses are not.

Isomer

A molecule with the same chemical composition (same number of atoms of each type) as another, but with a different chemical structure (arrangement or configuration of those atoms). Two chemicals which are isomers of each other may produce effects on the body that are similar or completely different.

Isometric Exercises

Not involving contraction or extension; isometric exercises are done by tightening the muscles without moving any part of the body, such as by pushing against a brick wall instead of lifting a weight

Isotonic Exercise

Muscular action in which there is a change in length of muscle and weight) keeping tension constant. Lifting free weights is a classic isotonic exercise.

IPF - International Powerlifting Federation

An international governing body that oversees the rules and regulations of powerlifting competitions; IPF-sanctioned competitions and judging are overseen by national-level powerlifting associations that are affiliated with the IPF.

IU

IU stands for "International Unit." It's a unit of measurement used to standardize the potency of the fat-soluble vitamins A, D, and E. These units measure the activity of the vitamins rather than their weight.

IWF - International Weightlifting Federation

An international governing body that oversees the rules and regulations of Olympic lifting competitions.

J

Jefferson Squats
A variation on the squat which is performed with the bar held in the hands, usually using a reverse grip with one end of the bar in front of the lifter and the other behind. The movement is a lot like a deadlift, except that the bar is rotated close to ninety degrees and generally is not allowed to touch the floor at the bottom of the movement.

Judging Rounds
In the universally accepted and applied IFBB system of judging, body-builders are evaluated in three distinctly different rounds of judging, plus a final pose down round for only the top five competitors after the first three rounds have been adjudicated. In Round One, the competitors are viewed in groups and individually in seven well-defined compulsory poses; in Round Two, they are viewed semi-relaxed from the front, both sides, and back; and in Round Three, they perform their own uniquely personal free-posing routines to their own choice of music. Overall, this use of three rounds of judging and a pose down round results in a very fair choice of the final winners of a bodybuilding champion-ship.

Juice
Meaning anabolic steroids. Other slang words for steroids include: gear, sauce, roids...

K

Kcal
1000 calories, or one "food calorie"

Ketogenic
Producing or causing the body to produce ketones.

Ketogenic Diet
A diet involving the restriction of carbohydrates to the point of inducing ketosis (buildup of significant levels of ketones in the bloodstream). Usually this requires keeping carbohydrate consumption below 20 grams per day.

Ketosis reduces appetite and some studies (but not all) have shown ketogenic dieters to lose relatively more fat and less lean body mass than non-ketogenic dieters. Note, however, that ketogenic diets are not usually well-suited for actually gaining muscle.

Kickboard
Small foam board used for short sprints to develop leg power and speed when swimming. Held under the chest so that the arms are not involved in the swimming stroke.

Kilogram, kg
one kilogram = 2.2 pounds

Kilometer
Metric measurement used in athletic events. One kilometer equals 0.62 miles. A 10K race is 6.2 miles, and a 5K is 3.1 miles.

Kinesiology
Study of muscles and their movements.

Knee Wraps
bands of fabric wound tightly around the knee during powerlifting to slightly increase lifting ability; their use should be avoided during general training (apart from right before a competition) since they can obstruct blood flow, compress nerves, and grind the kneecap against the front of the knee joint, resulting in inflammation and possible damage to the cartilage of the knee joint.

Krebs Cycle
A sequence of chemical reactions occurring within the mitochondria of living cells in which acetic acid (produced from foods) is oxidized to produce high-energy phosphate bonds (converting ADP to ATP) to be used to power the body's other metabolic processes. Also known as the citric acid cycle .

L

Lactic Acid
A waste product of glucose and glycogen metabolism produced in the muscles during intense exercise. Causes pain and soreness.

Lacto-vegetarians
People who include milk products but exclude meat, poultry, fish, seafood and eggs from their diets.
lacto = milk

Lacto-ovo-vegetarians
People who include milk products and eggs, but exclude meat, poultry, fish and seafood from their diets.
ovo = egg

Lateral Raise
An exercise for the deltoids performed by standing or sitting with the torso erect while holding a dumbbell in each hand. The weights are raised slowly out to the sides until they are at shoulder level and then slowly lowered (rather than allowing them to drop uncontrolled).

For the stress to be placed on the medial deltoid rather than the anterior, the palms must face downwards through the movement. Elbows should be kept rigid but slightly bent throughout the movement.

Lateral Raise, Bent
A variation on the lateral raise performed with the torso leaning forward almost parallel to the floor, shifting the stress primarily to the posterior deltoid. It can be done seated, standing, or on one knee, the palms should face downwards throughout the movement, and you should "squeeze" the posterior deltoids at the top of the movement.

Lats
The latissimus dorsi muscles are either of two wide, flat, triangular-shaped

muscles that run from the vertebral column to the humerus. Their development creates the V-shaped torso.

Layoff
Most intelligent bodybuilders take a one- or two-week layoff from bodybuilding training from time to time, during which they totally avoid the gym. A layoff after a period of intense pre-competition preparation is particularly beneficial as a means of allowing the body recover from injuries that might have cropped up during the peaking cycle .

LDL
This stands for "low-density lipoprotein" and is a subcategory of choles-terol, typically thought of as the "bad" cholesterol. Levels of LDL cholesterol can be elevated by ingestion of saturated fats and a lack of exercise.

Lean Body Mass
Everything in the body except for fat, including bone, organs, skin, nails and all body tissue including muscle. Approximately 50-60% of lean body mass is water.

Legs Day
The day when you train legs.

Libido
A measure of a persons sex drive

Lifestyle
Individual patterns of your typical life.

Lift Off
Assistance in getting weight to proper starting position.

Ligament
A tough cord or band of dense white fibrous connective tissue that connects two or more body parts other than muscles such as providing support for an internal organ or holding the ends of two bones together at a joint. Compare tendon

Linoleic Acid
An essential fatty acid and, more specifically, an omega-6 polyunsaturated fatty acid. Good sources of this fatty acid are safflower oil and soybean oil.

Linolenic Acid
An essential fatty acid and, more precise an omega-3 poly-unsaturated fatty acid. It is found in high concentrations in flaxseed oil.

Lipid
fat (usually when in the body rather than in food)

Lock Out
Partial repetition of an exercise by pushing the weight through only last few inches of movement.

Lower Abs
Abbreviation for abdominal muscles below the navel. Max- Maximum effort for one repetition of an exercise.

Low-Carb, Locarb
a genre of diet characterized by the reduction in carbohydrate intake, often but not necessarily to a ketogenic degree.

Lumbar
Lower region of you spine, vertebrates L1 to L5. Used for bending and extending the body forward and back, with the aid of the abdominal and erector spinae muscles.

M

Macronutrient
A nutrient (such as protein, carbohydrate, or fat) used in large quantities to provide energy for life and/or raw materials for synthesizing or repairing tissue

Machine, Weight Machine
Equipment moved in the performance of an exercise which is not simply raised and lowered as a complete unit. Exercise machines may guide or restrict the direction and extent of a movement, use cams, lever arms, pulleys, or cables to redirect or alter the resistance, or generate the resistance through springs, hydraulic or pneumatic pistons, magnets, or elastic bands rather than weights.

Manta Ray®
A molded plastic accessory intended to increase comfort and stability of the bar during squats . One side is shaped to fit across the shoulders of the lifter and the other is designed to clip snugly around the bar.

Max
Maximum effort for one repetition of an exercise.

Mass
Size - lots of it. If you train hard and eat right, you can add muscle. A growing bodybuilder's favorite word!

mcg/ug
microgram

Meal
Food that's eaten at one rime. Each meal should contain a portion (which is the size of the palm of your hand or your clenched fist) of protein and a portion of carbohydrates.

Medline
PubMed, the National Library of Medicine's free search service to access the 9 million citations in MEDLINE and Pre-MEDLINE (with links to participating on-line journals), and other related databases.

MET
The expression of the rate of work (power output) for the human body at rest, or a metabolic equivalent.

Mesomorph
Body type with thick muscles and heavy bone structure

Metabolic Rate
The rate you convert energy stores into working energy in your body. In other words, it's how Fast your 'whole system" runs. The meta-bolic rate is controlled by a number of factors, including: muscle mass (the greater your muscle mass, the greater your metabolic rate), calorie intake, and exercise.

Metabolism
The use of nutrients by the body. It's the process by which sub-stances come into the body and the rate at which they are used.

Metabolite
Achemical produced by the body from some other chemical such as a com-ponent of food, a supplement, or a drug.

Micronutrient
A nutrient (such as a vitamin or mineral) needed in small quantities for the normal functioning of the body

Midsection
Muscles of abdominal area, including upper and lower abdominals, obliques and rectus abdominis muscles.

Military Press
Pressing either a barbell or dumbbells straight overheard from shoulder height to full arm extension with an erect torso. Performing this exercise while seated puts less strain on the lower back than if it is done standing.

Minerals
Naturally occurring, inorganic substances that are essential for human life, which play a role in many vital metabolic processes.

Mitochondria
Cellular organelles found outside the nucleus that provide energy for the rest of the cell by oxidizing nutrients to produce ATP

Mixed Pairs Competition
Couples' competition, a relatively new form of bodybuilding competition in which man-woman teams compete against others with particu-larly ap-pealing posing routines featuring adagio and other dance movement

Mmol/mmole
One-thousandth of a mol/mole. See also mol/mole.

Mol/mole
Mol (also spelled mole) is the base unit in the International System of Units for the amount of pure substance that contains the same number of particles as there are atoms in exactly 12 grams of the isotope carbon 12.

Multi Set
A series of exercises (usually 4 or 5) performed one after another with little pause. The total comprises one multi-set of perhaps 3, 4 or 5 multi-sets, the trainee in pursuit of specific goals (peak athletic conditioning, muscularity, aerobics, change of pace).

Muscle Confusion
A technique to counteract the cessation of growth that occurs when muscles adapt to the training demands placed upon them. To keep the body growing and getting stronger, a bodybuilder needs to vary his/her sets, reps, rest, weight used and exercise angles during each workout.

Muscle Head/muscle Hedz
Slang for someone whose life is dominated by training.

Muscle Spasm
Sudden, involuntary contraction of muscle or muscle group.

Muscle Tone
Condition in which a muscle is in a Constant yet slight state of contraction and appears firm.

Muscularity
An alternative term for "definition" or "cuts."

Myositis
Muscular soreness due to inflammation that often Occurs 1-2 days after unaccustomed exercise.

N

Nautilus
Isokinetic type exercise machine, which attempts to match resistance with user's force.

Needle Gauges
The lower the number, the bigger thickness of the needle (ex. 20g is bigger than a 22g)

Negatives
The negative, lowering portion of an exercise

Negative Reps
One or two partners help you lift a weight up to 50% heavier than you would normally lift to finish point of movement. Then you slowly lower weight on your own.

Nitric Oxide/NO
A key signalling molecule in the body, synthesized from arginine. Nitric oxide causes blood vessels to dilate, which increases blood flow and contributes to a "pump" during a strength training session. NO supplements provide arginine and/or arginine precursors to enhance this reaction during a workout.

Non-locks
Performing an exercise without going through complete range of motion. For example, doing squat without coming to full lockout position of knees or pressing a barbell without locking out elbows.

NPC
The National Physique Committee, Inc., which administers men's and women's amateur bodybuilding competitions in the United States. The NPC National Champions in each weight division are annually sent abroad to compete in the IFBB World Championships.

NSAID/Non-steroidal Anti-inflammatory

an anti-inflammatory agent or drug that is not a steroid; NSAIDs include aspirin, ibuprofen, naprosyn, and ketoprofen, but not acetaminophen.

Nucleus, Cell Nucleus

The main central organelle in the eukaryotic cell that contains DNA and directs the growth and activity of the cell. Most cells have exactly one nucleus, but striated muscle cells and some slime molds have multiple nuclei within a single cell, and red blood cells lose their nucleus before entering the blood stream (and are no longer able to divide)

Nutrasweet

Artificial, non-caloric sweetener, brand name for aspartame.

Nutrients

Components of food that help nourish the body: that is, they provide energy or serve as "building materials." These nutrients include carbohy-drates, fats, proteins, vitamins, minerals, water, etc.

Nutrition

The applied science of eating to foster greater health, fitness, and muscular gains. Through correct application of nutritional practices, you can selectively add muscle mass to your physique, or totally strip away all body fat, revealing the hard-earned muscles lying beneath your skin.

Obesity

Severe overweight. Someone with a body fat percentage exceeding 30.

Obliques

Abbreviation for external obliques, the muscles to either side of abdominals that rotate and flex the trunk.

Odd Lifts

Exercises used in competition other than snatch and clean and jerk, such as

squats, bench presses, and barbell curls.

Olympian
A term reserved for use when referring only to a bodybuilder who has competed in the Mr. Olympia or Ms. Olympia competitions.

Olympic Plate
Olympic plates have 2" holes--actually 2-1/8" typically, to give them room to slip onto a 2" diameter bar. There's some variation in size of the holes in the plates and in the diameter of the bar, depending on whether the manufacturer is thinking in ISO/standard units (2" diameter bar) or metric (5cm, a little smaller).

A lot of Olympic plates say "standard" on them. Ignore this, it's only the hole size that matters, no matter how many people try to convince you that "size doesn't matter."

Olympic Lifting
Weightlifting as traditionally performed in the Olympics involving the clean and jerk and the snatch ; at one time the standing overhead press was included in this category, but it was removed decades ago.

Omega-3 Polyunsaturated Fatty Acids
Unsaturated fatty acids with the double bond at the third carbon position. Omega-3 fatty acids include alpha-linolenic (found in large quantities in flax seed oil) and eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids (found in fish oils)

One Rep Max (1RM)
Your absolute strength in a given movement. Powerlifting competitions are a test of 1RM strength. For many bodybuilders, especially beginners, 1RM training is harmful because of the higher risk of injury. A weight that you can just complete in 10 reps is a good approximation for most people of 75% of their 1RM. Effectively, the greatest amount of weight that can be handled by a lifter for a single repetition in good form.

Onion Skin
Slang denoting skin with very low percentage of subcutaneous fat which helps accentuate muscularity.

Optimal Nutrition
The best possible nutrition; distinct from merely adequate nutrition, which is characterized by no overt deficiency. This term describes people free from marginal deficiencies, imbalances, and toxicities, and who are not at risk for such.

Organelle
Any identifiable specialized part of a cell that is, to an individual cell, much like an organ like the heart or liver is to the body. Examples of organelles include mitochondria and the nucleus

Origin
The point of attachment of a muscle closest to the body's midline or center.

Osteoporosis
A condition that affects especially older women and is characterized by decrease in bone mass with decreased density and enlargement of bone spaces producing porosity and fragility.

OTC/Over The Counter
Sold without a prescription

Overload Principle
Applying a greater load than normal to a muscle to increase its capability

Overtraining
Training beyond the body's ability to repair itself. This can be caused by training the same body parts too frequently so that the body does not have time to recover before the next workout; workouts that are consistently harder than the body is able to recover from fully; or impairment of the body's normal recovery ability due to nutritional deficiencies, illness, or stress.

Besides impairing athletic performance, overtraining can increase the risk of injury or disease. Symptoms of overtraining include fatague, reduced performance, and increased resting heart rate.

P

Parasympathetic Nervous System
Branch of the autonomic nervous system that slows the heart rate.

Partial Reps/Partials
Performing an exercise without going through a complete range of motion either at the beginning or end of a rep.

Patella
The kneecap

PDCAAS/Protein Digestibility Corrected Amino Acid Score
The latest measure of protein quality, based on mg of a limiting amino acid in 1 gram of the test protein, divided by the mg of the same amino acid in 1 gram of a reference protein, multiplied by the percent fecal digestibility. The PDCAAS is limited as a tool for comparing some proteins as all scores over 1.00 are arbitrarily rounded down to 1.00.

Peak
As a bodybuilder prepares for a contest, he/she cuts bodyfat to an unusually low level to bring out maximum muscularity that can be maintained for only a short time, usually only a few days.

Peak Contraction
Exercising a muscle until it cramps by using shortened movements.

Pecs, Pectoralis Major
The two large muscles on the front of the chest

Peptide
A short chain of amino acids

PER - Protein Efficiency Ratio
A measure of protein quality based on the weight gain of experimental animals (rats) divided by their intake of a food protein during the test period.

Periodization
Periodization is a training method where over a series of weeks the number of reps is dropped and the weights increased. The idea behind this is to shock the muscles into growth by varying the reps & weights. Part of the theory of periodization revolves around the idea that a person can't always train with 100% intensity and that the body may actually need some periods of lighter weight, variable rep training to allow for recuperation. In addition, periodization is based on the idea that not all muscle fiber types can be trained with the same rep schemes. Many powerlifters follow some form of periodization to peak for a competition.

P.H.A. - Peripheral Heart Action
A system of training where you go from one exercise to another, with little or no rest, preferably alternating upper body and lower body exercises. Designed for cardiovascular training and to develop muscle mass.

Physical Fitness
An overall measure of physical attributes including cardiovascular endurance, muscular strength and endurance, body composition and flexibility.

Pinch Grip
An exercise to increase grip strength typically performed by pinching two weight plates together (smooth side out) and picking them up using only the fingers .

Pipes & Pythons
Slang for Arms

Placebo Effect
Pharmacological term used to describe the effects produced by an inert (inactive) substance. Often called "mind over matter," the placebo effect is used to explain the positive actions of many supplements, which are in many cases nothing more than nutrients.

Plates
The weights that you put on an Olympic dumbell, specifically a 45 pound weight. Smaller weights are called quarters (25 pounds), dimes (10 pounds), and nickels (5 pounds).

Plyometric Exercise
Where muscles are loaded suddenly and stretched, then quickly contracted to produce a movement, Athletes who must jump do these, i.e. jumping off bench to ground, quickly rebounding to another bench.

PNF/Proprioceptive Neuromuscular Facilitation
Stretching exercises used to increase an individuals flexibility.

Portion
The serving size of different foods one should eat with each meal.

Pose
Each individual stance that a bodybuilder does onstage in order to highlight his muscular development.

Pose Down
Bodybuilders performing their poses at the same time in a competition, trying to out pose one another.

Post-Cycle Therapy
The period following a prohormone or anabolic steroid cycle, designed to facilitate the recovery of normal testosterone production.

Potentiate
To increase the effect(s) of, usually used in reference to the effects of a drug.

Power Cage/Power Rack
A "cage" typically made with four vertical bars, each capable of supporting hooks and/or crossbars which may be placed at any of several possible heights. This allows a barbell to be placed at a comfortable starting height for squats, bench presses, military presses, etc.

Often, another set of hooks or a pair of crossbars will be placed at a lower

height to catch the barbell if the lifter is unable to return it to the starting position.

Preacher Bench
A"bench" somewhat like a very heavy-duty music stand turned away from the lifter with a padded, steeply inclined support for the backs of the lifter's arms and often (but not always) a seat behind. Placing the arms on a support like this prevents them from moving except at the elbow while performing curls.

Preacher Curls
Also known as Scott curls (after Larry Scott), a variation of bicep curl in which the back of the arm is supported, generally on a preacher bench and usually but not necessarily with the elbow placed forward of the shoulder.

Pre-exhaustion
To perform one or more sets of an isolation movement prior to the performance of a compound movement .

Prime Mover
Amuscle or group of muscles whose contraction produces the movement in an exercise .

Polpharmacology/Polypharmacy
Terms used to describe the bodybuilding practice of simultaneously stacking numerous performance-enhancing drugs.

Positive Nitrogen Balance
Biochemical state where nitrogen levels are sufficiently high enough to allow protein synthesis to occur. Positive nitrogen balance is one of the conditions accelerated by anabolic steroids.

Power
Strength + Speed.

Power Mindset
The state of being where you feel self-reliant, confident, and strong.

Power Lifting
A second form of competitive weightlifting (not contested in the Olympics, however) featuring three lifts: the squat, bench press, and deadlift. Power lifting is contested both nationally and internationally in a wide variety of weight classes for both men and women

Power Lifts
Three movements used in powerlifting competition: the squat, bench press and dead lift.

Power Training
System of weight training using low repetitions, heavy weights.

Progression
The act of gradually adding to the amount of resistance that you use in each exercise. Without consis-tent progression in your workouts, you won't overload your muscles sufficiently to promote optimum increases in hypertrophy.

Progressive Resistance
Method of training where weight is increased as muscles gain strength and endurance, the backbone of all weight training.

Prohormone
"Prohormones" are actually hormones themselves and are chemicals produced by the body (or close "chemical cousins" of such chemicals, as is the case with the nor- varieties). The "pro-" part is used for two reasons: first, because rather than themselves being the hormone one is actually interested in supplementing, they are instead used by the body's biochemical pathways to produce the hormone of interest; second, marketing.

Prone, Pronation, Pronated
Turning face-down or palm-down

Prostaglandins
Hormone-like substances made from fatty acids in plasma membranes, which control such processes as digestion and cardiovascular functioning.

Protein
Digestible food components containing nitrogen composed of amino acids; protein is essential for tissue repair and growth and provides four calories per gram.

Pseudoephedrine
an isomer of ephedrine that is a far weaker stimulant and bronchodilator and is used primarily as a decongestant. It is not a suitable substitute for ephedrine in the ECA stack

Pull Buoy
A foam flotation device designed to fit between your legs and keep the lower part of your body afloat without kicking. It allows you to work only your upper body and concentrate on your swimming stroke.

Pulley
a freely rotating wheel used to change the direction of force applied by a cable . The pulldown machine typically has a cable passing over one or more pulleys at the top so that a downward force applied to the cable by the lifter raises the weights at the far end of the cable.

Pullover
A pullover is an exercise where you lie on your back on a bench and reach your arms over and behind your head to pick up a weight (a barbell or dumbbell).

Moving just your shoulder joint (don't change the angle of your elbows, lift the weight up behind your head and then forward so it's above your chest. Then, still moving just your shoulders, move it back the same way, over your head and then down behind your head to the starting position.

Pullovers are done with either straight arms (a "straight-arm pullover") which uses the pectoral muscles more, or with elbows bent through the whole movement, which puts almost all the force on your lats.

Pump
The tight, blood-congested feeling in a muscle after it has been intensely trained. Muscle pump is caused by a rapid influx of blood into the muscles to remove fatigue toxins and replace supplies of fuel and oxygen. A good

muscle pump indicates that you have optimally worked a muscle group.

Pumped
Slang meaning the muscles have been made large by increasing blood supply to them through exercise.

Pumping Iron
Phrase that has been in use since the 1950s, but recently greatly popularized. Lifting weights.

Pyramiding
The process of stepping up or down in weight as you train.

Quads, Quadriceps
The large muscle of the front of the thigh, composed of four heads: the vastus lateralis, vastus intermedius, vastus medialis, and rectus femoris. All of these join at a common tendon attached to the kneecap and all of them are involved in extending the knee joint. The rectus femoris attaches to the pelvic girdle (above the hip joint) rather than to the femur and in addition to extending the knee, it also flexes the hip. exercises targeting this muscle include

Quality Training
Training just before bodybuilding competition where intervals between sets are drastically reduced to enhance muscle mass and density, and low-calorie diet is followed to reduce body fat.

Range Of Motion/ROM
Refers to the limits of motion of the joints and muscles associated with an

exercise.

Rating Of Perceived Exertion/RPE

is the level of effort you feel you are putting into an activity. The Borg scale is a rating scale that helps you describe how hard you feel you are working in terms of a number from 6 to 20. Lower numbers on the scale are used to describe a lower level of effort, and higher numbers mean you are working harder.

RDA/Recommended Daily Allowances

Percent or amount of proteins, fats, carbohydrates, vitamins and minerals that should be included in the daily diet. The estimated amount of all nutrients needed daily to maintain optimal health. These estimates vary for different conditions, ages and disease processes.

Receptor

a chemical site either within the cell or on the surface of the cell membrane that responds to the presence of a chemical stimulus such as a hormone or neurotransmitter and triggers a series of chemical events that produce a response on a cellular level.

Recumbent Bike

A bicycle on which you sit in a reclined position with your back supported and your feet out in front. It can be an indoor, stationary-type or a moving, outdoor-style bike. It works the buttocks and hamstrings more than upright bicycles, and unlike uprights, supports the back.

Reciprocal Inhibition

Reflex relaxation in a muscle being stretched.

Rep, Repetition

A single complete performance of a movement, normally including both the concentric (working against resistance) and eccentric (allowing the weight to move in the direction it would if you let go) phases, so that at the end of one rep, the weight and lifter are back in the position they were in prior to the rep.

Rep Out

Repeat the same exercise over and over until you are unable to do any more.

Resistance Training / Resistance Exercise
Training with weights or other sources of resistance above and beyond the movement itself. Chin-ups are resistance training, jogging is not.

Resistive Cuffs And Boots
Foam buoyancy devices placed on the ankles and/or wrists to create extra resistance for water aerobics and water running. Shown to increase work-out intensity up to 5 times.

Rest Interval
Pause between sets of an exercise, which allows muscles to recover partially before beginning next set.

Rest Pause Training
Training method where you press out one difficult repetition, then replace bar in stands, then after a 10-20 second rest, do another rep, etc.

Rhomboids
The muscles that pull your shoulder blades inward. They attach to the vertebrae at the base of the neck and go diagonally to the inside edges of the shoulder blades.

R.I.C.E.
The formula for treating an injury such as a strain or sprain. The acronym stands for Rest, Ice, Compression and Elevation.

Ripped
visibility of fine detail below the level of individual muscles and muscle heads. To be "ripped," it should be easy to identify by sight the striations and muscle bands going across the heads of the deltoid, and the different heads of the

Rest Period
The amount of time you allow between sets and exercises

Rotator Cuff
Four muscles (supraspinatus, infraspinatus, teres minor, and subscapularis) that run from the shoulder blade to the the upper arm, or humerus which together stabilize the shoulder joint.

Roid Rage
Popular name given to the uncontrollable outburst of anger and violence exhibited by anabolic steroid users. Despite never being proven by the medical community, the term is continuously exaggerated by the mainstream media.

S

Saturated Fats
Fats comprised of fatty acids in which all possible bond positions along the carbon backbone are filled with hydrogens. Saturated fats are solid at room temperature, stable at high temperatures, and have long shelf-lives. While this makes them excellent for frying, especially deep frying, they have no nutritional or metabolic functions beyond providing calories.

Serratus Anterior
The muscle underneath and slightly forward of the armpit that gives this area a ridged appearance; if you can't find this muscle, your bodyfat percentage may be up into double digits.

Set
A group of consecutive repetitions. (e.g. "I did three sets of 12 reps on the bench press.") When you pick up a barbell, curl it ten times, and then put it down, that is one set of ten reps.

Shin Splints
The generic term for pain in the front of the lower leg. Most often caused by inflammation of the tendons (tendinitis), which can result when the tendons are subjected to too much force or repeatedly overstretched.

Running or walking on hard surfaces can contribute.

Shotgunning
Another term used to describe the practice of consuming mega doses of multi-athletic drugs. For many athletes the limiting factor on drug use is cost.

Shredded
To get ripped, to have extremely low body fat with superior muscle separation. Also, sliced, cut, and cross-straited.

Shrugs
An exercise for the trapezius performed by standing upright while holding a weight in both hands and lifting the shoulders up and down while the arms remain hanging downwards.

Single Set Training
A system of training among strength lifters where sets of single repetitions are practiced with near-maximum output to develop skill, tenacity, structure strength and muscle power.

Six Pack
A muscles so well developed that you can see the separate muscle under the skin where your stomach is.

Skull Crusher
The lying french press, in which you lower a barbell from full etension above your head down to your forehead and then extend at the elbows to press it back up.

Sleeve
The hollow metal tube fit over the bar on most exercise barbell and dumbbell sets. This sleeve makes it easier for the bar to rotate in your hands as you do an exercise. Spotters - Training partners who stand by to act as safety helpers when you perform such heavy exercises as squats and bench presses. If you get stuck under the weight or begin to lose control of it, spotters can rescue you and prevent needless injuries.

Slow-twitch
Muscle cells that contract slowly, are resistant to fatigue and are utilized in endurance activities such as long-distance running, cycling or swimming.

Smith Machine
Equipment that allows an integrated barbell to slide up and down along vertical rods using bearings for smooth motion. Usually incorporates several safety stops to limit the range of motion.

Smooth Muscle
Muscle tissue lacking the alternating dark and light bands that characterize striated muscle , composed of spindle-shaped cells with containing a single nucleus . Also known as "involuntary muscles" because their contraction and relaxation is not under direct voluntary control. Smooth muscle tissue lines the arteries, intestines, and is generally not attached to bones or ligaments.

Snake Oil
This is a general term used to describe any supplement or concoction that doesn't give the same degree of results as claimed by its advertisers.

Snatch
Olympic lift where weight is lifted from floor to overhead, (with arms extended) in one continuous movement (see also CLEAN AND JERK).

Soleus
The underlying head of the calf muscle which together with the gastrocnemius (the other head of the calf muscle) attaches to the heel through the achilles tendon and to the tibia and fibula just below the knee joint.

Sorbitol
A naturally occurring sugar alcohol commonly used in "sugar-free" products. Its caloric content is similar to ordinary sugar, but it is absorbed more slowly, reducing its glycemic index, but often causing gastric discomfort, gas, and diarrhea when consumed in large quantities because intestinal bacteria have ample time to begin breaking it down before it is absorbed. After being absorbed into the bloodstream, sorbitol is converted into fructose.

Spinal Erectors, Erector Spinae
Paired muscles on either side of the spine in the lower back whose function is to straighten the spine

Spotter
Partner who, if necessary, assists in placing heavy weight into position and acts as a safety in case fatigue prevents lifter from completing a repetition.

Split
Dividing exercises into groups performed during separate workouts.

Spot
Assist if called upon by someone performing an exercise.

Spot Reducing
A popular but false assumption that an individual can "burn" fat only in desired areas. Fat is not reduced selectively from exercised areas, but rather from total fat stored throughout the body.

Squat
The "king of exercises"; put a bar across your shoulders while you are in a standing position and, keeping your torso as upright as possible, squat down until the tops of your thighs are parallel to the floor or below.

Squat Bar
Astraight bar with knurling in both the center and sides to make it easier to grip and less likely to slip when placed across the back (or at least take more flesh with it if it does slip)

Squat Suit
Avery tight, usually neoprene bodysuit worn theoretically for protection, but in reality because it increases the amount of weight that can be lifted by compressing and applying a straightening force to the legs and hips.

Stack, Supplement Or Drug
A stack of drugs, typically indicates two or more different drugs being used typically concurrently.

Stack, Weight
Apile of weight plates drilled so that they can slide vertically on poles, most often two fixed solid rods and one moveable rod with a series of holes along its length, with a horizonal hole or gap in each plate such that a pin may be inserted through the hole or gap in the plate and into a matching hole in the moveable rod. This weight and all those above it may then be lifted by the moveable rod, which is typically attached to a cable or lever arm.

Stance
Foot and leg position during the performance of an exercise, particularly squats and deadlifts . This can make a great difference in the movement and the muscles targeted. For example, a wide stance in the squat allows for a more upright torso and tends to place more stress on the glutes and thigh adductors , while a narrower stance tends to shift stress more to the quads and lower back.

Standard Plate
A weight plate designed to be mounted on a one-inch diameter bar. Usually round with a central hole of about 1-1/8", they are commonly available in 1-1/4, 2-1/2, 5, 10, 25, and 50 pound sizes. Many olympic plates have "standard" written on them, but it's the size of the hole that matters.

Static Contraction Training
Training method using accurately measured isometric contractions in only the strongest range of motion in order to maximize intensity.

Static Stretch
A stretch that is held within the stretched position for several seconds, without movement.

Sticking Point
Most difficult part of a movement.

Straight Sets
Groups of repetitions (SETS) interrupted by only brief pauses (30-90 seconds).

Strength
The ability of a muscle to produce maximum amount of force.

Strength Training
Using resistance weight training to build maximum muscle force.

Stretching
A type of exercise program in which you assume exaggerated postures that stretch muscles, joints, and connective tissues, hold these positions for several seconds, relax and then repeat the postures. Regular stretching

exercise promotes body flexibility.

Stretch Marks
Tears (slight scars) in skin caused if muscle or fat tissue has expanded in volume faster than skin can grow.

Striated Muscle
muscle tissue composed of multinucleate cells with alternating dark and light bands. Also known as "voluntary muscles" because their contraction and relaxation can be controlled voluntarily.

Striations
Grooves or ridge marks seen under the skin, the ultimate degree of muscle definition.

Stripping
Having one or more spotters remove weights from the bar during a set so that the lifter can continue with a lighter weight after having reached failure compare working down the rack

Stroke
A condition which occurs from a blockage of one or more blood vessels in the brain. The affected areas may be damaged due to insufficient oxygen supply.

Sublingual
Absorbed into the bloodstream through the skin under the tongue, an area with especially thin skin and a rich blood supply. Bypasses the liver and the rest of the digestive system and exposure to all the acids and enzymes involved.

Sugar Alcohol
Structurally, a hydrogenated sugar molecule with taste and physical properties similar to sugar, but more slowly absorbed by the body. Sugar alcohols include xylitol, mannitol, sorbitol, and maltitol, and do appear naturally in some foods. Used in "sugar free" products because of their slow absorbtion rate (important for diabetics and those with hypoglycemia), they still contain calories and count as carbohydrates.

Sumo-style Deadlift
A style of deadlift performed with the feet wider than shoulder-width apart and the arms closer together and in between the knees. As the lifter's torso descends, the knees travel outwards (and slightly forwards). Most lifters can lift more in the conventional deadlift style, but a few can lift more sumo-fashion, and this style also keeps the torso nearly upright through the movement, placing less stress on the lower back.

Super Set
Alternating back and forth between two exercises until the prescribed number of sets is complete.

Superslow
SuperSlow is an exercise protocol whereby the weight is lifted in approximately 10 seconds and lowered in five seconds. It can be used with any kind of resistance equipment: free weights, Nautilus or other machines, or calisthenics (dry land) exercises.

Supination, Supinated
turning face-up or palm-up

Swiss Ball
A large inflatable ball typically used for support while performing exercises like crunches, leg lifts, hyperextensions, etc. A ball differs from a bench in that it acts as a "bouncy" unstable support, requiring coordination and effort on the part of the lifter to keep from falling over or off.

Symmetry
The shape or general outline of a person's body, as when seen in silhouette. If you have good sym-metry, you will have relatively wide shoulders, flaring lats, a small waist-hip structure, and generally small joints.

Sympathetic Nervous System
Part of the autonomic nervous system that prepares the body for activity by speeding up the heart rate.

Synergism, Synergistic
A combination of different components or elements which produce a result greater than the sum of the effects that would have been produced by

each one separately.

Synergist
muscles that assist in the performance of an exercise by adding to the force required to execute the movement

T

Tapering Off
Reducing quantities taken of a drug or supplement at the end of a cycle.

Target Heart Rate
The ideal intensity level at which your heart is being exercised but not overworked. Determined by finding your maximum heart rate and taking a percentage (60% to 85%, depending on fitness level) of it.

Telemetry
The process by which the heart rate is transmitted from a heart rate monitor chest strap to a receiver on a piece of cardiovascular equipment or in a wristwatch receiver.

Tendon
A flexible, non-elastic tissue that connects muscle to bone. The Achilles tendon is the large connector from the heel bone into the calf muscle.

Tether
Attached to a belt and then to a ladder or some other fixed point at poolside, a tether helps you turn a too-small pool into a swimmer's treadmill. For example, you can have a great workout in a hotel pool or any other pool that's too small for laps.

Tendon
A tough cord or band of dense white fibrous connective tissue that connects a muscle with another body part (such as a bone) and transmits the force produced by the contraction of the muscle to produce movement in the body part in question or to use that part as an "anchor" from which to

induce movement in another part of the body.

Testosterone
The primary natural androgenic and anabolic steroid hormone found in the body

Thermogenesis, Thermogenic
The generation of heat, usually through biological processes. Thermogenic drugs, such as ephedrine and caffeine increase the rate at which the body produces heat internally, generally through the mechanisms used to maintain body temperature.

Threshold
The heart rate at which lactic acid begins to build up faster than you can break it down.

Tibia
the larger bone of the shin (lower leg)

Time Dependent Ageing
The loss of function resulting from growing old.

TKD/Targeted Ketogenic Diet
A ketogenic diet in which a small quantity of high glycemic index carbohydrates are taken immediately before and/or following a workout to partially replenish muscle glycogen supplies.

Training Effect
Increase in functional capacity of muscles as result of increased (overload) placed upon them.

Training Straps
Cotton or leather straps wrapped around wrists, then under and over a bar held by clenched hands to aid in certain lifts (rowing, chin-ups, shrugs, dead lifts, cleans, etc.) where you might lose your grip before working muscle to desired capacity-

Training To Failure
Continuing a set until it is impossible to compete another rep without as-

sistance.

Transdermal

"Through the skin," as in transdermally-delivered drugs such as testosterone and estrogen patches. Transdermal delivery allows chemicals that would be broken down by the digestive system or destroyed by the liver to pass into the bloodstream. It also can provide a slow and steady level of the chemical rather than a sudden "pulse" when hitting the digestive system.

Trans-fatty Acids

Unsaturated fatty acids that have a "z" shape caused by unsaturated bonds being on alternate sides of the molecule. Naturally formed unsaturated fatty acids are normally in the "cis" configuration, with the unsaturated bonds on the same side of the carbon chain. The trans- configuration is typically produced by the partial hydrogenation of polyunsaturated fatty acids which is done to increase shelf life, heat stability, and thickness.

Trap Bar, Gerard Trap Bar

A weight bar with a diamond-shaped section in the middle, typically used for deadlifts and shrugs. During the exercise, the lifter stands inside the diamond and grips the transverse handholds on either side of the diamond.

Trapezius, Traps

A kite-shaped muscle of the back with the points of the "kite" at the base of the skull, the shoulders, and the center of the lower back. The trapezius is primarily visible as the pair of bulges on either side of the neck.

Tribulus terrestris

Herb or herbal extract supplying protodioscin, which has been shown to increase erectile response in rabbits. It has not, however, been shown to increase total or free testosterone levels and studies on strength and body composition on resistance-trained males have shown reduced gains in the tribulus group compared with the placebo group.

Triceps

The large three-part muscle that runs along the back of the upper arm.

Triglyceride

chemical name for fat, usually used when referring to fats in the bloodstream rather than in food. The name comes from the three fatty acid chains

that together with the glycerol "backbone" make up the molecule.

Trigger Point
An irritable spot usually found in soft tissue injury's, such as a knot within the muscle.

Trimming Down
To gain hard muscular appearance by losing body fat.

Tri Sets
Alternating back and forth between 3 exercises until prescribed number of sets is completed. Universal Law of Reciprocation- The more you help others, the more your life is enhanced.

U

Universal Machine
One of several types of machines where weights are on tracks or rails and lifted by levers or pulleys.

Unsaturated Fats
Fats containing fatty acids with some carbon-carbon double bonds. Saturated fats have all possible positions that could be occupied by a hydrogen atom filled, leaving no double bonds in the carbon chain.

Upper Abs
Abbreviation for abdominal muscles above the navel.

Upregulation
Increasing the activity or responsiveness of a physiological process by increasing the number of available receptors.

Upright
One of (usually) a pair of vertical columns usually with hooks or other supports at the top and/or along the side to support one end of a barbell. These are typically found on either side of a bench or an area used for per-

forming squats. A power cage is essentially four uprights bolted together with a platform or crossbars.

Uptake
Absorbtion or incorporation of a substance, especially into a cell or tissue.

V

Variable Resistance
Strength training equipment where the machine varies amount of weight being lifted to match strength curve for a particular exercise-usually with a cam, lever arm or hydraulic cylinder.

Vascular
Vascularity The visibility of veins on a bodybuilder as a result of exercise and low bodyfat (and perhaps higher blood volume). Increase in size and number of observable veins. Highly desirable in bodybuilding.

Vastus Intermedius, Lateralis And Medialis
3 of the 4 muscles of the thigh that make up the quadriceps. Strong quads help protect your knees. The 4th muscle is the rectus femoris. Cycling, skiing, running and hiking downhill work these muscles!

Viagra
Brand name of sildenafil, a selective type 5 cGMP phosphodiesterase inhibitor, which enhances nitric-oxide-dependent vasodilation in the corpus cavernosum, thus increasing erectile response in males suffering from impotence; note that viagra does not initiate or increase sexual drive or desire or affect testosterone levels.

Virilization
The process in which a person takes on the characteristics of a mature male. Masculinization.

Vitamins
Organic compounds that are vital to life, indispensable to bodily function,

and needed in minute amounts. They are calorie-free essential nutrients.

Volume
Refers to the quantity of exercise in a workout rather than the intensity. Volume and intensity are inversely proportional.

VO_2max
The maximum amount of oxygen a person can utilize per minute of work. Often written down as an evaluation of a persons cardiovascular efficiency.

V-Taper
A person with big shoulders and a small waist.

W

Warm-up
The 10-15-minute session of light calisthenics, aerobic exercise, and stretching taken prior to handling heavy bodybuilding training movements. A good warm-up helps to prevent injuries and actually allows you to get more out of your training than if you went into a workout totally cold.

Weider Principles
Einstein may have been unsuccessful in his attempts to create a unified field theory, but this has done nothing to discourage Joe Weider in his campaign to unify the field of weightlifting and bodybuilding by naming any and all practices and techniques "The Weider [X] Principle" where [X] stands for, well, pretty much anything. If you aren't following any recognizable training style and just do whatever comes to mind, you can rest assured that you are actually following the "Weider Instinctive Training Principle" or perhaps the "Weider Muscle Confusion Principle," depending on whether you're at all consistent about it from one workout to another.

Weight Class
In order for bodybuilders to compete against men of similar size, the IFBB has instituted weight classes for all amateur competition. The normal men's

weight classes are 70 kilograms (kg), 154 pounds (lbs); 80 kg, 176 lbs; 90 kg, 198 lbs; and over 90 kg. In a minority of competitions, particularly in the Far East, one additional class 65 kg, or 143 lbs is also contested.

Weightlifting
The competitive form of weight training in which each athlete attempts to lift as much as he can in well-defined exercises. Olympic lifting and power lifting are the two types of weightlifting competition.

Weight Training Belt
Thick leather belt used to support lower back. Used while doing squats, military presses, dead lifts, bent rowing, etc

Wilks Formula
Named after Robert Wilks, a formula used to determine the best lifter or lift of powerlifters of different body weights.

Working "Down The Rack"
Using a sequence of dumbbells or (less commonly) barbells with decreasing weights, a lifter performs an exercise to failure with one weight and then immediately switches to the next ligher weight. By the time you have completed working "down the rack," you may not be able to lift your arms, straighten them completely, or you may simply be shaking from the kind of agonizing pain that tells you, "wow, that was a good workout!"

Workout
A combination of exercises performed in succession with brief rest periods between them.

X-Ray
Internal view of the body, showing high density structures such as bones and teeth, using medical equipment.

Y

Yohimbe, Yohimbine

Yohimbine is an extract from the bark of the tree Pausinystalia yohimbe. Most supplements of yohimbine are promoted as natural sources of testosterone or test enhancers. Yohimbine is an alpha-adrenergic blocker used clinically to treat impotence (often in conjunction with methyltestosterone). Actual yohimbine is difficult to come by over the counter. It will definitely enhance the libido (get the real stuff by prescription if you want to know by how much.

Yoga

A system of exercises for attaining bodily or mental control and well-being. Various forms of yoga include poses (or asanas) for building strength and flexibility, breathing exercises for cleansing, and/or meditation for relaxation and stress reduction.

Z

ZMA

A mineral formula of composed of bioavailable zinc, magnesium and vitamin B-6.

Zone Diet

Zone Diet, by Barry Sears, a diet based on a 30/40/30 protein, carb and fat macronutrient split.

Zygomatic Bone

More commonly known as the upper cheek bone.

Fat Loss Revealed by Will Brink

Return to T.O.C.

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