BULKING FOR ENDOMORPHS

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Chapter 1
- Introduction

It seems that whenever someone writes an article about bulking (a diet program geared towards gaining muscle mass), it is directed either to ectomorphs or mesomorphs, but completely ignores endomorphs. Why does this matter? Because the common strategies for gaining muscle mass written for ectomorphs or mesomorphs are not optimal for endomorphs. This is due to physiological and metabolic differences between these three phenotypes.

The simplistic distinction between the three different phenotypes when it comes to body composition changes is:

- Ectomorph—naturally skinny and has a hard time gaining weight (both muscle and fat).
- Mesomorph—naturally built and has the tendency to gain weight easy but can also lose weight fairly easy.
- Endomorph—naturally heavy and has an easy time gaining weight (more so fat than muscle) and a hard time losing it.

If an endomorph was to follow the same "hardgainer" diet that is prescribed to an ectomorph they would definitely gain weight, but it would be a lot of fat. Endomorphs need to find a dietary balance that allows them to gain strength and lean mass without adding a ton of fat.

I would also like to state that I do not like the term "bulking" diet. Some bodybuilders feel that they need to eat everything in sight to gain weight while bulking. I do not agree with that approach. Instead, I prefer to call a diet geared towards gaining muscle a "lean mass" diet. One's body weight can be divided into two basic groups, fat mass and lean mass. Fat mass includes one's body fat stores (adipose tissue) while lean mass includes skeletal muscle, bone, and other organs.

When a bodybuilder eats a hypercaloric diet, their goal is not just to gain weight, which could be both fat and lean mass, but rather to gain LEAN MASS. The strategies outlined in this book will help endomorphs gain lean mass, not fat mass.

I want to note that throughout this book when I talk about endomorphs I am referring to a person's natural phenotype and genetic make-up, not someone who is overweight or obese simply due to years of a sedentary lifestyle and overeating. This book will discuss the physiological and metabolic causes underlying why some people gain fat easier than others and key dietary and exercise strategies endomorphs can incorporate to keep their bulking gains LEAN.

Chapter 2

- Explanation on Phenotypes: What Makes an Endomorph an Endomorph

The term phenotype is defined as "The observable physical or biochemical characteristics of an organism, as determined by both genetic makeup and environmental influences." (dictionary.com). Ones body type/structure can be placed in three phenotypes:

- Ectomorph—Naturally skinny, narrow bone structure, has a hard time gaining weight
- Mesomorph—Naturally built, broad shoulders, can gain or lose weight relatively equally
- Endomorph—Naturally heavy, wide bone structure, gains weight easily

There is a clear visible physical distinction between the three phenotypes, but what is not visible and often ignored is the biochemical and metabolic differences between the three phenotypes.

I'm sure everyone has a friend that seems to have the ability to eat endless amounts of junk food and never gain an ounce of fat. On the other hand, you may feel like you gain fat just from smelling cake or pizza. Why is your friend able to pig out and not add weight while you gain weight so easily? It all comes down to the biochemical make-up of your body.

One's biochemical make-up refers to the cumulative sum of all of its metabolic processes. Examples of such processes in reference to gaining fat include:

- Lipolysis—The release of fat in the form of fatty acids from adipose tissue (fat cells).
- Lipogenesis—The storage of fatty acids and accumulation of fat in adipose tissue.
- De Novo Lipogenesis—The formation of fat from non-fat sources, specifically acetyl CoA (i.e. carbohydrates).
- Fat Oxidation—The burning of fatty acids to obtain energy.

These four processes are all involved in regulating fat loss and gaining fat and are controlled by a host of other processes, which all work together to maintain a balance of homeostasis.

In order to create a diet that allows an endomorph to gain lean mass while keeping fat gains to a minimum, one must understand the principle metabolic reasons that cause endomorphs to gain fat: insulin sensitivity and nutrient partitioning. This will be discussed in the next chapter.

Chapter 3
- Insulin and Glucose Uptake

In order for a cell to acquire nutrients to use in energy production, the nutrients must be transported across the cell's membrane. The hormone insulin is used to activate the transportation of nutrients into cells and is considered the "storage" hormone. Insulin secretion causes the uptake of amino acids, free fatty acids, and especially glucose to be increased. When one ingests carbohydrates, their blood glucose level, also referred to as their blood sugar level, is elevated, which causes insulin to be secreted. It is insulin's job to return the blood glucose level back to a normal, homeostatic range.

When insulin is secreted, the breakdown of stored nutrients (glycolysis, lipolysis etc.) is turned off and the storage of nutrients is turned on. It would be counterproductive to breakdown stored glycogen to obtain glucose when glucose has just been ingested and is now in the bloodstream. This fact is important because when insulin is secreted, fat breakdown and oxidation is turned off! Therefore when one wants to increase fat oxidation to its fullest, insulin secretion needs to be limited.

The amount of insulin needed to return blood glucose levels back to normal after ingesting a given amount of glucose is called insulin sensitivity. Individuals have differing insulin sensitivities based mainly on their diet, activity level, and genetic factors. In most cases, an ectomorph and mesomorph are more insulin sensitive than endomorphs; this is one of the primary factors that cause endomorphs to gain fat more easily than ectomorphs and mesomorphs. An endomorph will need to secrete more insulin to shuttle a given amount of glucose into cells and therefore fat oxidation will be halted for longer than an ectomorph or mesomorph. Therefore, an endomorph needs to pay more attention to insulin secretion in order to keep gains lean.

The body does not like it when glucose is floating around in the blood stream, so after a meal the body increases the uptake and oxidation of glucose to get rid of it. Over time, consistently elevated blood glucose levels can lead to cells becoming insensitive to insulin or insulin resistant, meaning more insulin most be secreted to return blood glucose levels to normal and therefore fat oxidation is blunted longer (which will be discussed in Chapter 4). If endomorphs must secrete more insulin to return blood glucose levels to normal, then they are at a disadvantage when its comes to staying lean while bulking because fat oxidation will be turned off longer for them than an ectomorph or mesomorph and there is a greater chance for them to become more insulin resistant.

Before we continue I want to point out why there is great emphasis placed on muscle glycogen levels. Building new muscle proteins and adding inches to your arms is not a priority to the body. The body will not create new muscle proteins when it senses it is in need of energy. When muscle has a lot of glycogen, the body senses it has enough "extra" energy and can build new muscle proteins effectively. If muscle glycogen levels

are depleted, the body must replete glycogen stores in addition to increasing protein synthesis, both of which require energy and nutrients. Therefore, when gaining muscle is your goal, you want to have adequate muscle glycogen stores so more energy can be focused on protein synthesis. Now this is an isolated examination of muscle growth because there are many other factors besides glycogen stores that govern whether one gains muscle or not. Let's take a deeper look at the metabolic factors affecting glucose uptake.

Insulin promotes glucose uptake through the synthesis and translocation of the GLUT-4 glucose transporter, found on skeletal and cardiac muscle cells and adipocytes. In the absence of insulin, the GLUT-4 transporters lay under the cell's surface. When insulin is secreted, the GLUT-4 transporter translocates to the cell's surface allowing glucose to enter into the cell. There are other glucose transporters, but the GLUT-4 transporter is our primary concern.

Enzymes are protein molecules that catalyze (speed up) metabolic reactions. In the case of glucose uptake, there are two we will examine: hexokinase and glucokinase.
The enzyme hexokinase is found in skeletal muscle and promotes glucose uptake independently of blood glucose levels. Hexokinase has a high affinity for glucose, which allows muscle to take up glucose from the blood even when blood glucose levels are low. Once the muscle has the glucose, it keeps it for itself and the muscle does not release glucose back into the bloodstream. Insulin secretion further enhances glucose uptake in addition to hexokinase's actions.

The enzyme glucokinase is found in the liver and is activated when blood glucose levels are increased. Contrast to skeletal muscle, the liver is in service to all other cells of the body, so when it senses other cells need glucose it releases glucose and sends it to the other cells. Skeletal muscle holds on to its glucose for itself but the liver releases its stored glucose for other cells to use when they need it. Hexokinase is basically acting all the time to give muscle glucose but glucokinase is only acting in the presence of high blood glucose levels. What does all of this mean? It means that you do not need to jack insulin through the roof for your muscles to get glucose! In fact, it gets even better.

Exercise, especially resistance training, has been shown to increase GLUT-4 translocation on skeletal muscle in the absence of insulin, meaning after your lift weights you do not need insulin for your muscles to uptake glucose. While insulin will certainly enhance the anabolic response of a meal post workout, slamming 100 grams of dextrose (pure glucose) is not needed since skeletal muscle is already able to uptake glucose in the absence of insulin after a workout. Increasing the glucose content of skeletal muscle (in the form of glycogen) is beneficial for gaining muscle, but remember that GLUT-4 transporters also exist on fat cells and therefore insulin secretion promotes the storage of glucose in both skeletal muscle and fat cells. Therefore, one needs to increase the storage of glucose in skeletal muscle and decrease the storage of glucose in fat cells; this can be done by consuming low glycemic carbohydrates such as oatmeal post-workout instead of high glycemic carbs like dextrose.

In summary, it is not necessary to jack blood glucose and insulin levels through the roof in order to replenish glycogen and gain muscle. Skeletal muscle is able to uptake glucose whenever it needs it. In addition, skeletal muscle is primed to uptake glucose after exercise. By controlling your insulin levels you can gain lean mass while keeping fat gains to a minimum.

Chapter 4
- Insulin and Fat Oxidation

Insulin not only controls the uptake of glucose into cells but also has an impact on fat oxidation and storage. When blood glucose and insulin levels are low, fat is the main fuel burned for energy. But when blood glucose and insulin levels are high, fat burning is blunted and glucose oxidation is elevated. When the body senses there is glucose in the bloodstream, it wants to return blood glucose levels back to a homeostatic level. In order to do this the body must get rid of the glucose, which is accomplished by increasing glucose oxidation and storage. Since the body is focusing on storing nutrients, it would not make sense for fatty acids to be released from adipocytes because they would not be burned. Therefore it is important that blood glucose levels return to normal quickly so the oxidation of fat can once again become the primary source of energy. This can be done by (1) Controlling your carbohydrate intake and (2) controlling your insulin secretion.

Insulin blocks the formation of cyclic AMP (cAMP) by activating the enzyme phophodiesterase (PDE), which degrades cAMP. cAMP is needed to activate hormone sensitive lipase (HSL), the enzyme that catalyzes the liberation of fatty acids from fat cells. In the presence of high blood glucose and insulin, HSL cannot act on stored fat. Therefore, fatty acids cannot be liberated from fat cells and fat oxidation is put on the backburner while glucose oxidation and storage is made a priority. Insulin is termed an anti-lipolytic hormone because it blocks lipolysis—the breakdown of stored triglycerides fat into fatty acids.

In addition to blunting fat oxidation, insulin secretion stimulates fat synthesis in the liver and increases fat uptake by fat cells. After you eat a meal, dietary triglycerides (TG) are packaged within lipoproteins (LPs) in the liver. Packing fat allows it to float better through blood. Lipoprotein Lipase (LPL) is an endothelial enzyme that hydrolyses TGs into 3 fatty acids and glycerol, meaning LPL “extracts” fatty acids and glycerol from LPs so they can be used or stored when they reach target cells.

Insulin stimulates adipose tissue LPL and inhibits muscle LPL activity, which means in the presence of insulin fat cells uptake and store fat while skeletal muscle can not uptake it and therefore cannot oxidize it. In the presence of insulin, fatty acids are not oxidized in muscle but rather stored in fat cells. So not only are you decreasing the amount of fat you are burning by not controlling insulin secretion, you are also increasing fat storage! It should be clear that if you want to keep your fat gains down while on a hypercaloric diet, insulin levels must be controlled. This is done by calorie and carbohydrate management.

Chapter 5
- Carbohydrate, Calorie, and Insulin Management

The primary factor that determines whether you gain or lose weight is your caloric intake (how many calories you eat). If you eat more calories than you burn (hypercaloric diet) you will gain weight and if you burn more calories than you eat (hypocaloric diet) you will lose weight. When you eat exactly the same amount of calories as you burn it is called a maintenance caloric diet. Endomorphs trying to gain muscle need to eat a hypercaloric diet like anyone else who wants to gain weight, but they do not want to eat too many calories above maintenance.

A *simple* calculation to determine your maintenance caloric intake is to take your body weight and multiply it by 15; this gives you your total calories to be consumed each day. For example, a 200 pound person would consume 3,000 calories a day. This is a very basic way to determine your maintenance caloric intake and should be used as a starting point.

In addition to controlling your caloric intake, as an endomorph you want to control insulin secretion. This can be done by limiting carbohydrate consumption, especially high glycemic carbohydrates. Managing your insulin levels will allow you to keep your gains leaner.

Control your caloric intake and meal size with frequent small meals

One way to control your caloric intake is to eat frequent, smaller meals. Going long periods of time with no food causes your body to send signals to the brain telling it the body needs food. If you eat sporadic meals then you will most likely overeat on those meals. It is better to eat smaller, more frequent meals to prevent overeating. Eating smaller meals allows causes insulin secretion to be more controlled. Eating a 400 calorie meal will result in less insulin secretion than eating a 1,000 calorie meal (macronutrient content aside).

Limit total carbohydrate consumption

One of the physiological mechanisms that cause endomorphs to gain fat easily is poor insulin sensitivity. Insulin sensitivity refers to the cells response to insulin or insulin's efficiency on cells. A cell that is very insulin sensitive needs less insulin to uptake glucose (carbs) than a cell that is insulin insensitive. Insulin is anti-lipolytic (blunts fat oxidation) and increases fat storage. Therefore, if one has poor insulin sensitivity then more insulin will be secreted and fat oxidation will be blunted and fat

storage will be increased to a greater degree than if their cells were more insulin sensitive. In order to lose fat or keep fat gains to a minimum one must control insulin.

The consumption of carbohydrates leads to a large output of insulin since insulin is necessary for the uptake of glucose into cells. Eating large amounts of carbohydrates throughout the day will lead to elevated insulin levels, thereby decreasing fat oxidation. Dietary carbohydrates are necessary to gain muscle mass and normal body functioning, therefore they cannot be eliminated from the diet. Instead, they should be consumed during specific meals when your body needs them.

Limit carbohydrates to specific meals

Limiting carbohydrates to times when your body needs them will aid in muscle growth and limit fat gains. I recommend endomorphs to limit their carbohydrates to breakfast and pre/post workout. For example, if someone works out at 6 PM, I would recommend they consume some carbohydrates at breakfast, such as ½-1 Cup oatmeal, and post-workout, such as 5-10 oz. sweet potato. For all other meals they should consume green vegetables and small amounts of fruit. If you workout first thing in the morning, I would recommend following a similar setup, keeping your carbs in your pre and post workout meals.

No matter what your schedule is I do not recommend consuming dextrose, maltodextrin, or other high glycemic carbs post workout. Skeletal muscle has the ability to uptake glucose post-workout without "spiking" your insulin levels. Weight training increases GLUT-4 translocation in skeletal muscle, allowing the muscle to uptake glucose more efficiently. Studies do show that increasing insulin levels post workout does enhance protein synthesis, but I do not feel one needs to jack insulin levels through the roof with dextrose.

Eat quality foods—don't skimp on your fruits and veggies!

By consuming low glycemic index carbs, such as oatmeal and sweet potatoes as suggested above, one can limit the insulin output from their carb meals. For low carb meals, I recommend consuming green vegetables and fruit for endomorphs' carb intake. Green vegetables and fruit are both low GI carbs and contain fiber and numerous nutrients. On top of that, they are very filling. An example of a low-carb meal would be 4-6 oz. of chicken with 1 cup green beans and ½ an apple. In addition to carbs and protein, one should add fat to their meals to decrease insulin output, prolong digestion time, and to provide essential fatty acids (EFA). Examples of good fats include almonds and almond butter, peanuts and peanut butter, avocados, and flax and olive oil. One could simply add 20 almonds to the above meal to obtain their EFAs.

Eat less on days you do not workout

On days that you don't workout you do not need as many calories as you do on the days you do workout. I recommend isolating your carbs to breakfast only and eating

vegetables and fruits for the remainder of your carbs. The amount of carbs you consume on your off days should be adjusted according to the rate you are gaining weight, specifically fat. If you find you are gaining too much fat, then I recommend reducing your carb intake on your off days.

Chapter 6
-The Importance of Year Round Cardiovascular Training

Endurance A.K.A. cardiovascular training improves the heart's ability to pump blood and increases oxygen uptake into cells. A "fit" person also burns more fat at rest and during exercise than an unfit person. Bodybuilders use cardiovascular training mainly as a means to increase caloric expenditure thereby increasing fat loss or decreasing fat gain. By doing cardio year round you will increase your body's capacity to burn fat at both rest and exercise. Let's discuss what type of cardio to do.

Low-Moderate Intensity Cardio on Weight Training Days

As stated in the intro, bodybuilders primarily use cardio as a means to increase their caloric expenditure (Cardiovascular training has a TON of other health benefits, but we will not touch on those benefits here). The use of low-intensity cardio, done either pre or post weight training, allows one to burn more calories while not hampering recovery.
Low-intensity cardio is not as strenuous on the body as high-intensity cardio or high-intensity interval training (HIIT). It would be very hard for someone to complete a HIIT session pre weight training as it would decrease your performance when lifting weights, or to complete the session post weight training as it would be very fatiguing.

We want to keep the body healthy and injury free. If you get injured, then your workouts will suffer or cease altogether. Therefore, I feel it is more practical to perform low to moderate intensity cardio on weight training days. Now one could perform their cardio separate from their weight training, but for most that would mean two trips to the gym, which is impractical; Hence my recommendation to perform cardio pre or post weight training.

Whether you choose to do your cardio pre or post weight training is a personal preference. Remember, your main goal is to hit it hard in the weight room. If doing cardio pre weight training decreases your performance then it would be better for you to do it post workout. If you find that you are too tired to do cardio post weight training or simply find you become too bored and do not finish your cardio session, it would be better for you to do your cardio pre weight training.

High-Intensity/High-Intensity-Interval Training on Non-Weight Training Days

High-intensity cardio stresses both the aerobic and anaerobic energy systems. The anaerobic energy system is what is stressed during weight training. Putting too much stress on the anaerobic system and hampering recovery is one reason why I do not recommend performing weight training and HIIT on the same day. Obviously running at

6 mph will burn more calories than running at 3 mph, but one has to balance their activities to allow for proper recovery.

There are two main types of high-intensity cardio: Continuous and Interval Training. Continuous high-intensity cardio would be running at a high speed on the treadmill or elliptical machine for a long duration (i.e. 5+ minutes). Interval training involves alternating periods of work and rest (or lower levels of work). For example, running a 100 meter sprint then walking back to the start, resting, then repeating could constitute HIIT. HIIT is more intense than high-intensity continuous cardio and much more intense than low-intensity cardio.

Chapter 7
- Using Dietary Supplements to Fight against Your Genetics

In order to decrease fat gain during a bulking diet we need to do two things, (1) decrease fat storage in adipocytes and (2) increase the oxidation of the fat that WASN'T stored. Your diet and training will accomplish this to a degree, but with the use of specific supplements you can further enhance your ability to stay lean while bulking.

Supplements that Increase Fat Oxidation

Sesamin

Sesamin is a lignan isolated from sesame seeds. A lignan is a molecule that combines with another entity acting as an "activator." In the case of sesamin, it binds to and activates a receptor called Peroxisome Proliferator-Activator Receptor Alpha (PPARalpha). Sesamin has been shown to be a potent PPARalpha activator [1].

The PPAR receptor family is divided into three subgroups: alpha, beta/delta, and gamma. PPARalpha is highly expressed in muscle, the liver, kidneys, and heart and is involved in the regulation of lipid metabolism, specifically the transcription of the genes involved in the beta-oxidation (burning) of fatty acids and lipogenesis. Activation of PPARalpha increases gene expression of the fatty acid oxidation enzymes and decreases gene expression of lipogenic enzymes.

Of vital important, Sesamin increases the expression of the mitochondrial enzyme carnitine palmitoyl transferase (CPT), among other enzymes [2]. CPT, the rate-limiting enzyme in beta-oxidation of fatty acids in skeletal muscle and liver cell mitochondria, is found on the outer membrane of mitochondria and carries fatty acids across the membrane into the mitochondria by binding to them. Increasing the expression of CPT, along with other enzymes involved in beta-oxidation, will allow more fatty acids to be transported into the mitochondria where they can be oxidized.

In addition to increasing the oxidation of fat, Sesamin supplementation has also been shown to decrease lipogenesis (fat storage) by decreasing lipogenic enzymes in the liver. Sesamin has been shown to decrease lipogenic the gene expression of sterol regulatory element binding protein-1 (SREBP-1), acetyl-CoA carboxylase, and fatty acid synthase, among other lipogenic enzymes [3], which means less fat is esterified in the liver and therefore less fat is stored in adipose tissue (fat cells).

So Sesamin works in two ways to make you lean (and keep you lean): increasing fat oxidation and decreasing fat storage.

Fish Oil

Fish Oil supplements contain important essential fatty acids (EFAs), specifically the Omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Most people's diets are deficit in these Omega-3 EFAs. Fish Oil has been shown to increase fat loss and decrease fat storage through a similar mechanism as Sesamin, making it a great addition to an endomorphs supplement regime.

Conjugated Linoleic Acid (CLA)

Conjugated Linoleic Acid (CLA) is a mix of isomers of linoleic acid (commercially sold as a 50:50 mix of cis-9, trans-11 and trans-10, cis-12 isomers). Studies done on humans have shown decreased body fat and/or increased lean mass (though results are mixed). CLA is believed to influence body composition through regulation of lipid metabolism.

Studies have shown CLA to inhibit transcription of enzymes involved in de novo fatty acid synthesis/lipogenesis, desaturation of fatty acids, and triglyceride synthesis [4]. It is believed that CLA decreases the activation of PPARgamma, resulting in the attenuation of fat cell differentiation. In mice, CLA supplementation has been shown to decrease adipocyte number and size as well as cause apoptosis (cell death) of adipocytes [4] and researchers believe CLA to have similar properties in humans.

Sesamin + CLA + Fish Oil Supplmentation

The combination of Sesamin + CLA should prove very potent for fat loss and fat gain prevention. Supplementing with CLA will cause a decrease in triglyceride uptake by adipocytes and lipogenesis/fat storage, but if these fatty acids are not oxidized, they will build up in the blood and liver leading to insulin resistance. By adding Sesamin into the mix, fat oxidation will be increased (very strongly in the liver), resulting in the oxidation of the elevated fatty acid concentration caused by CLA as well as working synergistically with CLA to decrease fat storage. The combination of Sesamin + CLA attacks fat oxidation and storage from multiple angles, resulting in less stored body fat [5].

Studies have also showed that Sesamin and Fish Oil work synergistically to increase fat oxidation primarily by increasing the gene expression of enzymes involved in fat oxidation [6].

**Common dosages for Sesamin range from 500-150 mg per day.*

**Common dosages for CLA and Fish Oil range from 3-6 grams per day each*

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Supplements that Increase Proper Carbohydrate Storage/Insulin Management

ALA

Alpha Lipoic Acid is an enzyme naturally produced in the body and functions as a co-factor for energy production and is a potent antioxidant. ALA has many benefits for athletes and health enthusiasts. ALA is a potent antioxidant. Unlike most antioxidants, which are either fat or water soluble and only have antioxidant properties in some tissues, ALA has antioxidant properties in all tissues. This is because ALA is water soluble and it metabolite dihydrolipoic acid is fat soluble, allowing it to reach all tissues. In addition to this, ALA recycles itself (Jones, 2002) and vitamin C, works synergistically with vitamin E, and increases glutathione levels (Vitamin C & E and Glutathione are all antioxidants). ALA has been shown to decrease oxidative stress caused by exercise to a greater extent that other antioxidants (Khanna, 1999).

ALA is believed to increase insulin sensitivity and glucose uptake by increase translocation of the glucose transporter Glut-4. Increasing insulin sensitivity and glucose uptake can lead to beneficial changes in body composition as well as improvement in ones general health.

Khanna S, Atalay M, Laaksonen DE, Gul M, Roy S, Sen CK. Alpha-lipoic acid supplementation: tissue glutathione homeostasis at rest and after exercise. J Appl Physiol 1999 Apr;86(4):1191-6

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ALCAR

Carnitine is a non-essential amino acid. Carnitine is acetylated into Acetyl-L-Carnitine (ALCAR) in the brain, liver, and kidneys. The amino acid L-Carnitine plays a vital role in energy metabolism, specifically the transport of fatty acids into mitochondria where they can be oxidized. ALCAR is the most popular form of supplemental carnitine.

ALCAR has a nutrient repartitioning affect, meaning it aids in sending nutrients to skeletal muscle where they can be used for energy over sending nutrients to fat cells where they can be stored. What this means is ALCAR has to ability to aid in muscle growth and fat loss by increasing fat oxidation and cellular metabolism (Iossa, 2002). A study done on women found that supplementing with ALCAR increased fat loss and fat oxidation during exercise (Hongu, 2003). Research has shown ALCAR to have a synergistic effect with ALA.

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Xtend—BCAA and Glutamine

The Branched-Chain-Amino Acids (BCAA), leucine, isoleucine, and valine, are different from the other 17 amino acids in that they are primarily metabolized in skeletal muscle (Layman, 2003) and metabolized at a much lower rate in the liver (Norton, 2005). The rate limiting enzyme in BCAA catabolism is Branched Chain Keto Acid Dehydrogenase, which is much more active in skeletal muscle than in the liver (Norton, 2005).

Glutamine is a glucogenic (glucose creating), nonessential amino acid that has multiple roles in the body. Glutamine is synthesized mainly in skeletal muscle and the liver and acts as a "nitrogen shuttle" between organs, a fuel for cells of the immune system and intestines, and a precursor for nucleotide synthesis (Holecek, 2002).

Point blank, exercise promotes increased BCAA oxidation (Shirmomura et al., 2004). This increased degradation of BCAA helps maintain energy homeostasis by providing carbon as a direct energy source and glucose homeostasis by providing substrates for the citric-acid cycle and gluconeogenesis (glucose-alanine cycle). Plasma and muscle glutamine levels are also decreased post workout and it can take hours before they are restored (Rowbottom, 1996).

Skeletal muscle and plasma glutamine levels are decreased during times of increased stress and metabolic demand, such as illness and exercise, while BCAA levels are often unchanged. Some may view this as meaning the BCAAs are not depleted or there is not a lack of BCAA during illness or exercise. But in reality, BCAA levels are not decreased because proteolysis of skeletal muscle and resynthesis of BCAA from branched-chain keto acids (BCKA) in the liver increases BCAA levels (Holeck, 2002). It is not that BCAA levels are not depleted, but rather they are kept elevated by breaking down skeletal muscle and resynthesizing BCAAs.

According to Houston (2001), *"Glutamine content in skeletal muscle and other tissues appears to have a regulatory role in whole body protein synthesis."* Glutamine levels inside muscle govern protein synthesis and nitrogen balance and therefore muscle growth (VanAcker et al. 1999). The newly synthesized glutamine is created by using BCAAs obtained from muscle protein breakdown (Holecek, 2002).

What all this means is Glutamine requirements are trying to be met during/post workout by BCAA catabolism causing BCAA catabolism/muscle protein breakdown to be increased.

One way to increase skeletal muscle hypertrophy is by decreasing BCAA oxidation and therefore skeletal muscle catabolism. This can be accomplished by supplementing with BCAA and Glutamine.

Glutamine administration has been shown to decrease leucine oxidation (Holeck, 2002). The mechanism behind this decrease in oxidation is believed to be that glutamine oxidation increases NADH levels (and increases the NADH/NAD+ ratio), thereby inhibiting BCKA dehydrogenase, which is the “key-enzyme” in BCAA oxidation (Holeck, 2002).

Research on leucine shows that once the minimum requirement of leucine for protein synthesis is met leucine can then be used to activate the mTOR pathway (Layman, 2003). It may sound like leucine is free to exert its powerful effect of mTOR activation, but one must remember that protein breakdown and synthesis is occurring throughout the entire body; the body's protein stores are in a constant state of flux.

Plasma and muscle glutamine levels are decreased post workout and it can take hours before they are restored (Rowbottom, 1996). A study examining the effect of free-form glutamine and glutamine peptide ingestion on muscle glycogen resynthesis found that plasma glutamine was decreased by 20% post workout with the ingestion of glucose only (control), showed no change with ingestion of whey protein or wheat protein hydrolysate plus glucose drinks, and a 200% increase with ingestion of free-form glutamine plus glucose drink (VanHall, 2000). Free-form glutamine supplementation was needed to elevate plasma glutamine levels post workout.

In addition to restoring and elevating plasma glutamine levels, oral glutamine supplementation increases muscle glycogen storage to the same capacity as glucose (Bowtell, 1999).

The constant body protein flux plus the increased BCAA/leucine oxidation caused by exercise means that leucine is in high demand and therefore may not be able to participate in muscle growth at its full potential. This is where supplementing with additional BCAA and Glutamine comes into play. Supplementing with Glutamine will help keep skeletal muscle and plasma Glutamine concentrations elevated and decrease BCAA/leucine oxidation and therefore muscle catabolism. Supplementing with BCAA will help meet the increased BCAA oxidation caused by exercise by providing substrates for energy production and protein synthesis and serving as precursors for alanine and glutamine. This means there will be more BCAA/Leucine available to stimulate protein synthesis through mTOR-dependent and independent pathways. In addition, supplementing with BCAA and glutamine will help keep glycogen levels elevated.

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Chapter 8

-Building a Bodybuilding Foundation: Training Routine & Workout Nutrition

Training

When first getting into bodybuilding, people will often copy the workouts done by pro bodybuilders or do set after set of isolation exercises. In the quest to gain quality muscle, I feel there is a much more efficient way to build your bodybuilding foundation. Below is a 4-day split, and a variation to its setup, that I feel anyone would benefit from, but especially beginner bodybuilders.

Setup #1

	Monday			Tuesday	
1	Bench Press	3 X 4-6	1	Squats	3 X 8-12
1	Bent Over Row	3 X 4-6	1	Standing Calf Raise	3 X 8-12
2	Military Press	3 X 4-6	2	Stiff Leg Deadlift	3 X 8-12
2	Barbell Shrug	3 X 4-6	2	Seated Calf Raise	3 X 8-12
3	Close Grip Bench	3 X 4-6	3	Leg Extension	3 X 8-12
3	Barbell Curl	3 X 4-6	3	Leg Curl	3 X 8-12

	Thursday			Friday	
1	Bench Press	3 X 8-12	1	Deadlift	3 X 4-6
1	Bent Over Row	3 X 8-12	1	Seated Calf Raise	3 X 4-6
2	Military Press	3 X 8-12	2	Leg Press	3 X 4-6
2	Barbell Shrug	3 X 8-12	2	Leg Press Calf Raise	3 X 4-6
3	Close Grip Bench	3 X 8-12	3	Walking DB Lunges	3 X 12
3	Barbell Curl	3 X 8-12			

***Alternate sets of the exercises with the same number.
***For example, do a set of bench press, rest 60-90 seconds, do a set of bent over row, repeat.
***Perform 30 minutes of low-intensity cardio after every workout. Aim for a heart rate of 130-140 bpm.

The reasoning behind this program is simple; we are sticking to the main compound lifts. The main goals are to increase strength and muscle mass. The routine is separated into “heavy” and “light” days with Monday and Friday being “heavy” and Tuesday and Friday being “light”. This setup allows you to have more time between your heavy workouts, allowing for better recovery. Alternating between sets, not supersetting, but rather resting between alternating exercises allows each muscle to recover more between sets without wasting time.

Setup #2

	Monday			Tuesday	
1	Bench Press	3 X 4-6	1	Squats	3 X 4-6
1	Bent Over Row	3 X 4-6	1	Standing Calf Raise	3 X 4-6
2	Military Press	3 X 4-6	2	Stiff Leg Deadlift	3 X 4-6
2	Barbell Shrug	3 X 4-6	2	Seated Calf Raise	3 X 4-6
3	Close Grip Bench	3 X 4-6	3	Leg Extension	3 X 8-12
3	Barbell Curl	3 X 4-6	3	Leg Curl	3 X 8-12

	Thursday			Friday	
1	Bench Press	3 X 8-12	1	Deadlift	3 X 4-6
1	Bent Over Row	3 X 8-12	1	Seated Calf Raise	3 X 8-12
2	Military Press	3 X 8-12	2	Leg Press	3 X 8-12
2	Barbell Shrug	3 X 8-12	2	Leg Press Calf Raise	3 X 8-12
3	Close Grip Bench	3 X 8-12	3	Walking DB Lunges	3 X 12
3	Barbell Curl	3 X 8-12			

***Alternate sets of the exercises with the same number.
***For example, do a set of bench press, rest 60-90 seconds, do a set of bent over row, repeat.
***Perform 30 minutes of low-intensity cardio after every workout. Aim for a heart rate of 130-140 bpm.

The difference between setup #1 and #2 is both squats and deadlifts are done in the 4-6 rep range. Because both squats and deadlifts are such great mass builders, one would benefit from training heavy on both exercises.

Workout Nutrition

Dextrose, dextrose, DEXTROSE! NO!!! I do not recommend dextrose (or other high glycemic carbs) to endomorphs. The reasoning behind this is the large, rapid spike in insulin can lead to fat gain given endomorphs poor insulin sensitivity. As bodybuilders, we want to add muscle and loss fat. I do not think one should gain a large amount of fat for the sake of gaining muscle. Instead, I recommend getting a solid food meal 60-90 minutes pre-workout, consisting of a low-glycemic carb source such as oatmeal and whey protein. My current pre-workout meal is:

- 1 Cup Oatmeal
- 1 Cup Skim Milk
- 1 Scoop Chocolate Protein Powder
- 2 TBSP Smucker's Natural Peanut Butter

I mix all of this together in a bowl (the oatmeal is uncooked) then eat it. It tastes similar to those no-bake chocolate oatmeal cookies, obviously not as sweet though.

Next comes what I call "workout nutrition" aka pre/during/post-workout nutrition. Here, again, no dextrose and actually no carbs. The carbs from your last meal with be enough to provide the needed muscle and blood glucose for your workout. Here we opt for free-form BCAA. There are a number of BCAA supplements on the market, but I use Scivation Xtend. Xtend comes in grape, lemonade and watermelon flavors, which compliment each other very well. I recommend 1 scoop of Xtend per 20 pounds of

bodyweight*. In order to save money, you can only use Xtend during your workouts and none on off days. My workout nutrition is:

- 10 Scoops Grape Xtend
- ½ gallon water

Xtend also contains L-glutamine and citrulline-malate, both of which are beneficial to performance and recovery.

*Note that this is the high-end of dosing and you do not have to use that much Xtend. I would recommend getting at least 4-6 scoops of Xtend during your workout.

Finally we have post-workout nutrition. I recommend waiting 30 minutes after your workout and eating another solid food meal. Finish up whatever Xtend (if any) you have left over. If your main goal is to add mass, this meal should contain protein, carbs, and fat. An example meal would be:

- 1 Chicken Breast
- Sweet Potatoes (50-75 grams of carbs)
- Almond Butter (Can put this on the sweet potatoes)
- 1 Cup Green Vegetables

Because we are trying to limit fat gain the bulk, (almost all) of your carb intake will be comsumed at breakfast or pre and post workout and in the form of complex, low glycemic carbs. Now we will create an entire program using what we have discussed.

Chapter 9
-Putting Everything into Action

Weight Training and Cardio Program
Monday: 45-60 minutes Weight Training followed by 30 minutes Low-Intensity Cardio
Tuesday: 45-60 minutes Weight Training followed by 30 minutes Low-Intensity Cardio
Wednesday: 15-20 minutes of High-Intensity Cardio on the Elliptical Machine (Optional)
Thursday: 45-60 minutes Weight Training followed by 30 minutes Low-Intensity Cardio
Friday: 45-60 minutes Weight Training followed by 30 minutes Low-Intensity Cardio
Saturday: 15-20 minutes of High-Intensity Cardio on the Elliptical Machine **or** HIIT—Sprints: Ten 100 meter sprints (Optional)
Sunday: Some much needed **REST!**
***Note: As you lose/gain weight and your fitness level improves you will most likely have to increase you duration and intensity of your cardio sessions.

Supplement Option #1 (Morning Trainer)
Meal 1 (Complex carbs such as oatmeal)
- 1 Capsule Sesamin + 100 mg R-ALA + 500 mg ALCAR

Workout Nutrition—6 Scoops Xtend
Meal 2 (Complex carbs such as sweet potatoes)
- 2 Capsules Fish Oil + 2 Capsules CLA + 100 mg R-ALA + 500 mg ALCAR

Meal 3
- 1 Capsule Sesamin

Meal 4
- 2 Capsules Fish Oil + 2 Capsules CLA

Meal 5
- 1 Capsule Sesamin

Meal 6
- 2 Capsules Fish Oil + 2 Capsules CLA

***Vegetables and Fruit should be consumed for carbs in all meals not marked complex carbs.

Supplement Option #2 (Evening Trainer)
Meal 1 (Complex carbs such as oatmeal)
- 1 Capsule Sesamin + 100 mg R-ALA + 500 mg ALCAR

Meal 2
- 2 Fish Oil Capsules + 2 CLA Capsules

Meal 3
- 1 Sesamin Capsule

Meal 4
- 2 Fish Oil Capsules + 2 CLA Capsules

Workout Nutrition—6 Scoops Xtend
Meal 5 (Complex carbs such as sweet potatoes)

- 1 Capsule Sesamin + 100 mg R-ALA + 500 mg ALCAR

Meal 6

- 2 Fish Oil Capsules + 2 CLA Capsules

***Vegetables and Fruit should be consumed for carbs in all meals not marked complex carbs.

Diet Option #1 (Morning Trainer)

Meal 1 (Complex carbs such as oatmeal)

- 2 Servings Complex Carbs
- 4-6 Servings Protein
- 2-3 Servings Fat

Workout Nutrition—6 Scoops Xtend

Meal 2 (Complex carbs such as sweet potatoes)

- 2 Servings Complex Carbs
- 4-6 Servings Protein
- 2-3 Servings Fat

Meal 3

- 1 Serving Fruit
- 2-3 Servings Vegetables
- 4-6 Servings Protein
- 2-3 Servings Fat

Meal 4

- 2-3 Servings Vegetables
- 4-6 Servings Protein
- 2-3 Servings Fat

Meal 5

- 1 Serving Fruit
- 2-3 Servings Vegetables
- 4-6 Servings Protein
- 2-3 Servings Fat

Meal 6

- 2-3 Servings Vegetables
- 4-6 Servings Protein
- 2-3 Servings Fat

Diet Option #2 (Evening Trainer)

Meal 1 (Complex carbs such as oatmeal)

- 2 Servings Complex Carbs
- 4-6 Servings Protein
- 2-3 Servings Fat

Meal 2

- 1 serving Fruit
- 2-3 Servings Vegetables
- 4-6 Servings Protein
- 2-3 Servings Fat

Meal 3

- 2-3 Servings Vegetables
- 4-6 Servings Protein
- 2-3 Servings Fat

Meal 4

- 1 Serving Fruit
- 2-3 Servings Vegetables
- 4-6 Servings Protein
- 2-3 Servings Fat

Workout Nutrition—6 Scoops Xtend

Meal 5 (Complex carbs such as sweet potatoes)

- 2 Servings Complex Carbs
- 4-6 Servings Protein
- 2-3 Servings Fat

Meal 6

- 2-3 Servings Vegetables
- 4-6 Servings Protein
- 2-3 Servings Fat

Simply choose foods from the High Performance Food List in chapter 10 to meet the suggested servings for each meal. The number of protein, fat, complex carb, fruit, and vegetables serving can be adjusted to keep you gaining. If you are gaining too much fat, decrease the servings. If you aren't gaining weight, increase the servings.

Chapter 10
- High Performance Food List

High Performance Nutrient Selection

Starches (equal to 1 serving of Carbohydrate)

12-15 grams carbohydrate

BREADS

* Bagel - whole-wheat, oat-bran, 9-grain (3.5 inch)	½ or 42g
* Bread - whole-wheat, oat-bran, 9-grain	1 slice or 32g
* Ezekiel bread (sprouted grains NO FLOUR)	1 slice
* Whole Wheat English muffin	½ or 33g
* Whole Wheat Pita bread (6.5 inch in diameter)	½ or 32g
* Whole Wheat Tortilla, 6 inches across	1 or 35g
CEREALS & GRAINS	
* Barley (pearled) (dry)	1.25 tbsp or 15.6g
* Kashi Medley	1/3 cup or 19.8g
* Cream of Wheat regular or quick (dry)	1.5 tbsp or 16.7g
* Granola, low-fat (Heartland brand)	2.5 tbsp or 16.5g
* Grape-Nuts (Post brand)	2.5 tbsp or 16.5g
* Honey	¾ tbsp or 15.8g
* Millet (dry)	1.5 tbsp or 18.75g
* Oat Bran (dry)	3.5 tbsp or 20.5g
* Oatmeal (Quaker Instant/Old Fashion, dry)	¼ cup or 20g
* Pasta, wheat (noodles, bowtie, shells etc), (cooked)	1/3 cup or 46g
* Quinoa Grain (dry)	1.75 tbsp or 18.6g
* Rice, brown long-grain (cooked)	1/3 cup or 64.35g
* Rolled Oats	¼ cup or 20.25g
* Steel Cut Oats, dry	1/8 cup or 20g

STARCHY VEGETABLES

* Baked potato (no skin)	63.8g or 2.25 oz
* Baked Sweet potato (baked no skin)	56.7g or 2 oz
* Yams (baked, no skin)	56.7g or 2 oz

DRIED BEANS & LENTILS

ALSO COUNTS AS 1 MEAT SERVING

* Black Beans (S&W - canned)	106g or 3.75 oz
* Red Kidney, Pinto Beans (Green Giant - canned)	85g or 3 oz

Fruits (equal to 1 serving of Carbohydrate)
12-15 grams carbohydrate

* Apple, (with peel)	3.25 oz or 92g
* Banana, (peeled)	2.25 oz or 64g
* Blueberries (fresh)	3.5 oz or 99g
* Grapefruit, (peeled)	6.5 oz or 184g
* Grapes	3 oz or 85g
* Mango (fresh)	3 oz or 85g
* Orange, (peeled)	3.5 oz or 99g
* Pineapple	4 oz or 113g
* Peach (fresh)	4.55 oz or 127.5g
* Pear (fresh)	3 oz or 85g
* Papaya (fresh)	5 oz or 141.75g
* Raisins (seedless)	2 tbsp or 18.5g
* Strawberries (fresh)	6.5 oz or 184g
* Watermelon (fresh)	5 oz or 141.75g

Milk (equal to 1 serving of Protein & 1 serving Carbohydrate)
12-15 grams carbohydrates
6-8 grams protein

MILK & VERY LOW-FAT MILK

* Skim milk (0 grams fat)	1 cup or 8 Floz
* 1% Milk	1 cup or 8 Floz
* Plain non-fat yogurt	¾ cup or 6 oz
* Yoplait/Dannon Light Fruit yogurt	6 oz (1 container)

LOW-FAT MILK

Also Counts as 1 Fat serving

* 2 % milk	1 cup or 8 oz
* Plain low-fat yogurt	¾ cup or 6.5 oz
* Sweet acidophilus milk	1 cup

WHOLE MILK

Also Counts as 2 Fat servings

* Whole milk	1 cup or 8 oz

Vegetables (equal to 1 serving of Vegetables)
4-6 grams carbohydrates

- **All servings sizes are based on (raw or steamed)**

* Asparagus 4 oz or 113 g
* Broccoli 2.75oz or 78g or ½ cup
* Cauliflower 2.75oz or 78g or ½ cup
* Green Beans 2.2oz or 62.5g or ½ cup
* Onions 53g or 1.86 oz or 1/3 cup
* Spinach 125g or 4.4oz or 2/3 cup
* Celery 120g or 4.25 oz or 1 cup
* Cucumber 156g or 5.5 oz or 1/3 cup
* Green onions 50g or 1.75 oz or ½ cup
* Mushrooms 78g or 2.5 oz or ½ cup
* Tomato 90g or 3.2 oz or ½ cup
* Salad greens (lettuce, romaine) 165g or 5.2 oz or 3 cups

Protein (equal to 1 serving of Meat)
6-8 grams protein

VERY LEAN MEAT (all measurements AFTER cooked)

* Chicken breast (white meat) boneless/skinless	1 oz or 28.35g
* Turkey breast (LEAN)	1 oz or 28.35g
* Fresh fish (cod, haddock, halibut, tuna, tilapia)	1 oz or 28.35g
* Shell fish (crab, lobster, shrimp)	1.25 oz or 35.5g
* Egg whites	2 or 67g
* Egg Beaters	¼ cup or 2.15 oz or 61g
* Non-fat cottage cheese	¼ cup or 2 oz or 57 g
* Salmon Fillet	1 oz or 28.35g (also counts as ½ fat serving)
* Lean Sirloin	¾ oz or 21.25g
* Egg (including yolk)	1 or 50g (also counts as 1 fat serving)
* Cheese 2% (Reduced Fat)	1 oz or 28.35g (also counts as 1 fat serving)
* Salmon	1 oz or 28.35g (also counts as ½ fat serving)

Fat (equal to 1 serving of Fat)
5 grams fat

MONOUNSATURATED FATS & POLYUNSATURATED FATS

* Avocado	1 oz or 28.35g
* Almonds (dry roasted)	1/3 oz (~ 6 pieces) or 1 tbsp or 8.6g
* Benecol light	1 tbsp or 14g
* Cashews	1/3 oz or 1 tbsp or 9.65g
* Enova oil	1 Tsp or 4.5g
* Flax oil	1 Tsp or 4.5g
* Mayonnaise (Light, reduced-fat)	1 Tbsp or 15g
* Oil (olive or canola, Enova)	1 tsp or 4.5g or 0.16 oz
* Peanuts	1/3 oz or 9.36g
* Peanut/Almond butter (smooth or crunchy)	2 tsp or 0.38 oz or 10.6g
* Pecans	¼ oz or 1 tbsp or 7.44g
* Salad dressing (Light, reduced-fat)	2 Tbsp or 30g
* Sesame seeds	1Tbsp or 1/3 oz or 9.4g
* Smart Balance Light spread	1 tbsp or 14g
* Sunflower seeds	1Tbsp or 1/3 oz or 9.0g
* Walnuts	1Tbsp or 1/4 oz or 7.5g

FREE FOOD LIST
Less than 20 calories per serving
Less than 5 gram carbohydrates per serving
Recommended at 1 serving per meal per day

FAT FREE or REDUCED FAT

* Cream cheese	1 Tbsp
* Creamers, non-dairy liquid	1 Tbsp
* Creamer, non-dairy powder	2 Tbsp
* Mayonnaise, fat-free	1 Tbsp
* Margarine, fat-free	4 Tbsp
* Miracle Whip, non-fat	1 Tbsp
* Salad dressing, fat-free	1 Tbsp
* Sour cream, fat-free	2 Tbsp

SUGAR FREE or LOW SUGAR

* Hard candy, sugar free	1 piece
* Gelatin dessert, sugar free	1
* Gum, sugar free	1 piece
* Jam or jelly. Low sugar or light	2 tsp
* Syrup, sugar free	2 Tbsp

DRINKS
* Coffee
* Club soda
* Diet soft drinks, sugar free
* Tea
* Tonic water

SUGAR SUBSTITUTES
Equal (aspartame)
Splenda (Sucralose)
Sprinkle Sweet (saccharin)
Sweet One (Acesulfame potassium)
Sweet ‘n Low (saccharin)

About the Author

Derek "The Beast" Charlebois is an ACE certified personal trainer, competitive bodybuilder, and holds a Bachelor's degree in Exercise Science from The University of Michigan. Derek is the Promotions Coordinator/R&D at Scivation/Primaforce and is involved in coordinating promotions, research and development, advertising, and marketing. Derek is an accomplished author with articles on such websites as Bodybuilding.com, Bulknutrition.com, the online magazines StrengthAndScience.com and *Game Over:* ***The Final Showtime Cut Diet You'll Ever Need! and The Lifestyle Diet: The Final Diet You'll Ever Need to Stay Lean and Healthy Forever.*** **Derek is available for online personal training; personal training inquiries can be sent to derek@scivation.com. His website is www.beastpersonaltraining.com.**