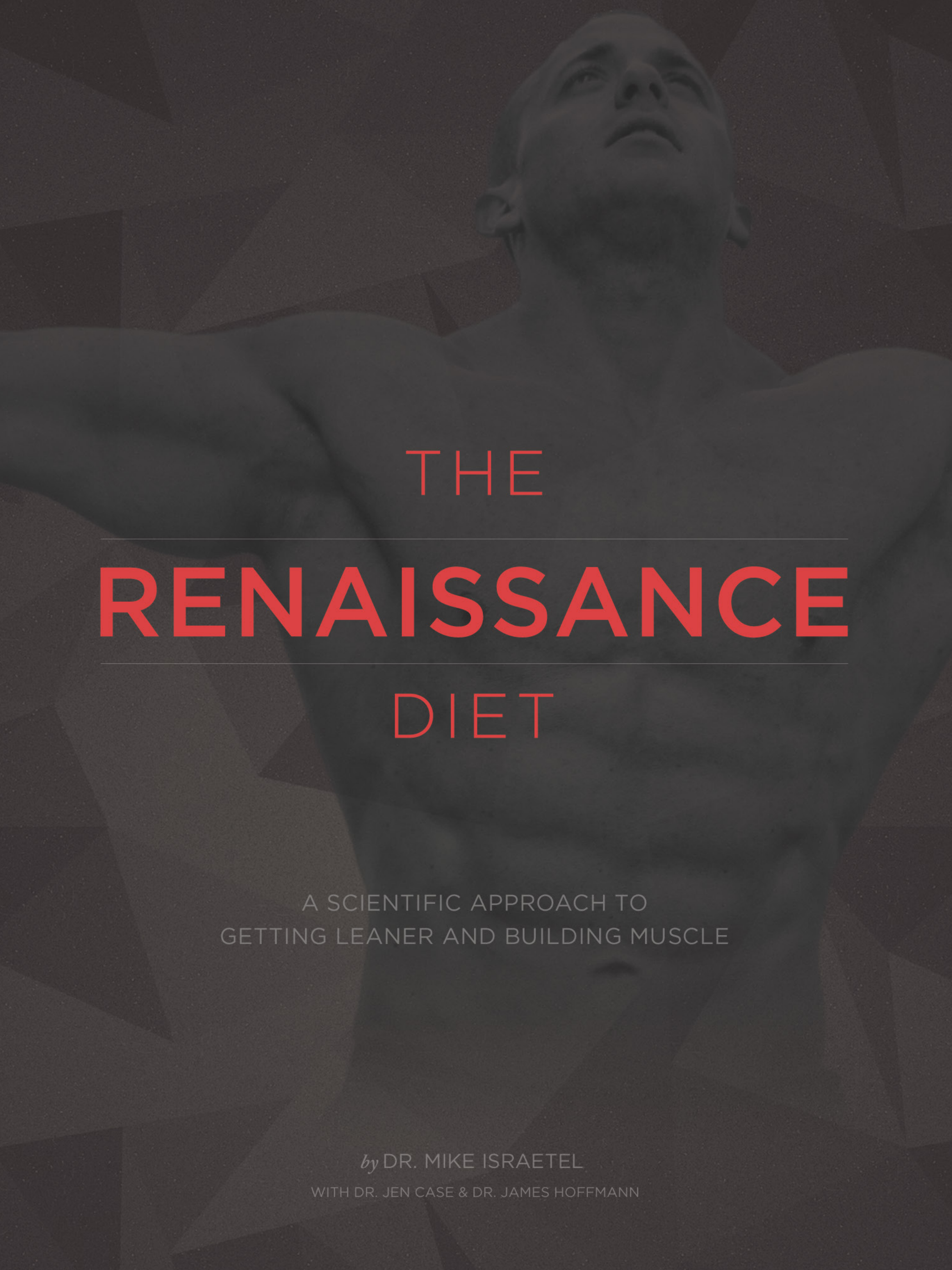
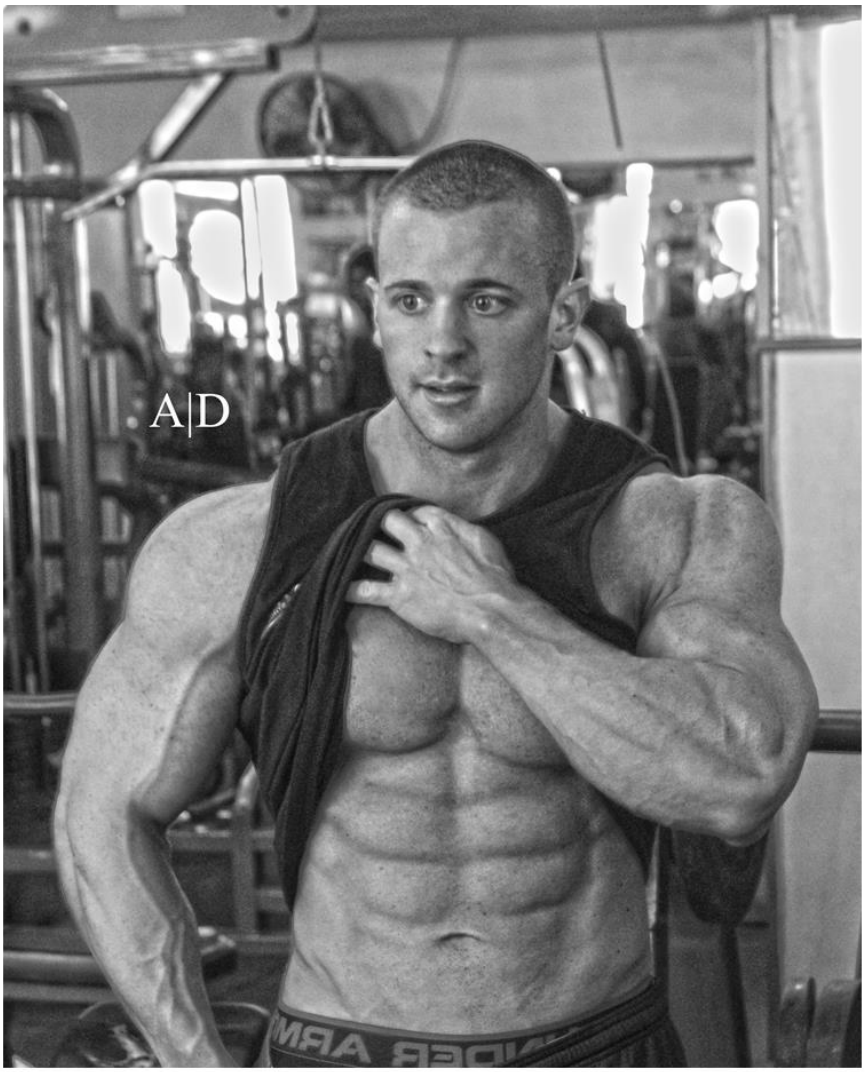


THE RENAISSANCE DIET

A SCIENTIFIC APPROACH TO
GETTING LEANER AND BUILDING MUSCLE

by DR. MIKE ISRAETEL
WITH DR. JEN CASE & DR. JAMES HOFFMANN



The Renaissance Diet

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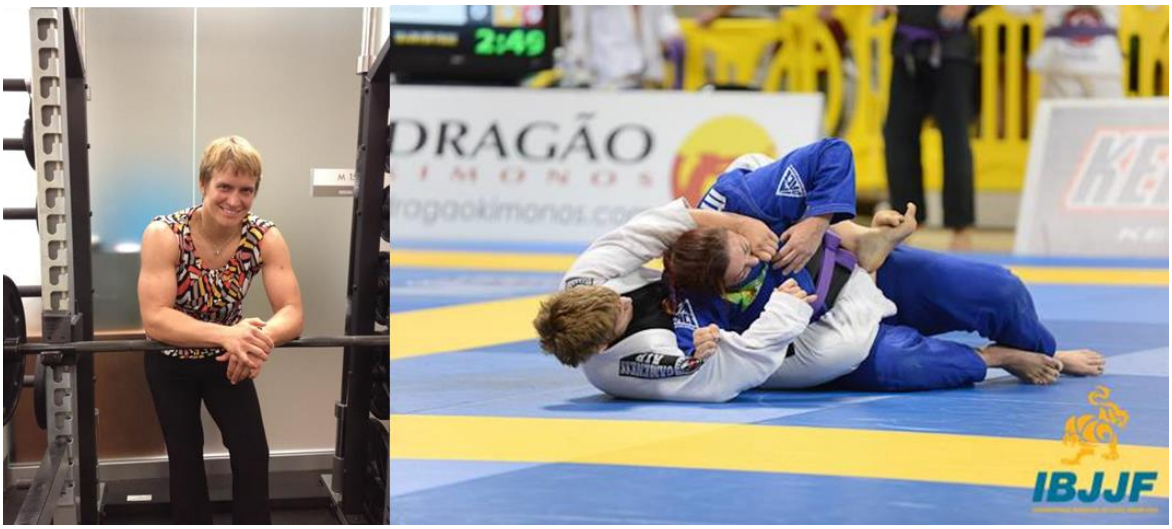
By Dr. Mike Israetel, with Dr. Jen Case and Dr. James Hoffmann

About the Authors

Mike Israetel, PhD

Mike is a professor of Exercise Science at the University of Central Missouri, where he teaches Exercise Physiology, Personal Training, and Advanced Programming for sports and fitness. Mike's PhD is in Sport Physiology, and he has been a consultant on sports nutrition to the U.S. Olympic Training Site in Johnson City, TN. Mike has coached numerous powerlifters, weightlifters, bodybuilders, and other individuals in both diet and weight training. Originally from Moscow, Russia, Mike is a competitive powerlifter, bodybuilder, and Brazilian Jiu Jitsu grappler.

Jennifer Case, PhD, ATC, CSCS



Jen is a professor of Exercise Science at the University of Central Missouri, where she teaches Programming for Special Populations, Advanced Nutrition, and Graduate Exercise Metabolism. Jen is a former Femme Fatales MMA World Champion, is the current IBJJF Master's World Champion in the purple belt heavyweight division, and is also a black belt in Hawaiian Kenpo Karate. Jen's PhD is in Human Nutrition with main coursework in Nutrition and Performance. Jen is currently a nutrition coach to numerous athletes, with CrossFit athletes as her specialty.

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About Renaissance Periodization

Renaissance Periodization is a diet and training consultation company. RP's consultants (including the authors of this book) write diets and training programs for every kind of client. RP works with athletes trying to reach peak performances, businesspeople that need more energy at work, and people from all walks of life who want to look and feel better. When he founded RP, CEO Nick Shaw had a vision for a company that delivered the absolute best quality of diet and training to its clientele. By hiring almost exclusively competitive athletes that are also PhDs in the sport, nutrition, and biological sciences, Nick has assembled a team of consultants that is unrivaled in the fitness industry. In addition to training and diet coaching, the RP team also writes numerous articles and produces instructional videos on diet, training, periodization science, and all matters involving body composition and sport. Visit us at www.renaissanceperiodization.com, email at renperiod@gmail.com.

The Renaissance Diet

A Scientific Approach to Getting Leaner and Building Muscle

Chapters:

Foreword: A Guide and Starting Point

The goal behind the writing of this book is very simple; to bring a scientifically valid, organized approach on dieting for body composition to an intelligent non-specialist audience. The information in this book is almost entirely derived directly from literature reviews and studies on the individual subjects addressed. This scientific understanding is also filtered through the experience of the authors in working with hundreds of individuals seeking to improve their body compositions including world class weightlifters and powerlifters, bodybuilders, crossfitters, volleyball, rugby, and soccer players, as well as active professionals seeking to improve their look and health. Thus, the tables and charts presented (especially in Chapter 9 on designing your own diet) are grounded in research but molded by the authors' experiences as well.

Because we've cemented our recommendations in hard science, each chapter is followed by an extensive list of references. Deviating from purely academic work, the references are not cited in-text and are mostly books and reviews of the literature, as opposed to individual studies. If you see something contentious or so interesting that you want to learn in greater depth about it, our best recommendation is to start with one of the referenced textbooks or literature reviews on the matter. If you're still curious, then taking a look at individual studies (cited within the books and reviews) may be a good next step. We cite the books and reviews here in addition to presenting the actual information for two reasons; because we mean this book as a guide to your body composition goals *and* because this book may also serve as a starting point for your journey deep into the intricacies of sport nutrition.

Whatever your goals are for reading this book, we hope this information helps. After all, this book was written for you.

- Mike Israetel

Chapter 1: The Dieting Principles and What they Mean

Almost every successful endeavor has been based on principles. Whether that endeavor is as big as designing a car or as relatively less impressive as gaining 5lbs of muscle mass over the course of several months. A properly-functioning car must be based on the principles of internal combustion or electricity, structural design, and computer control, among many others. A diet, similarly, must be based on principles that govern body composition, such as calorie balance, macronutrient intake, and nutrient timing.

Just as with designing a car that gets you from one place to another, all of the principles of dieting can be ranked from the most important and fundamental all the way down to the least. For example, the most important component of the car is the engine. Without it, the car doesn't go anywhere no matter what other features are included. Now, the frame and wheels come in at a close second, and the control systems right behind, but after that, the details are much less important. Even a car with only a steering wheel and pedals (no seats or displays) can get you from point A to point B, even though seats and windscreens highly enhance performance and comfort.

With diet design, there are 5 main dieting principles that we can rank from most important to least important. They are, in order:

1.) Calorie Balance
2.) Macronutrient Amounts
3.) Nutrient Timing
4.) Food Composition
5.) Supplements

Calorie balance is the most important principle of any diet, and has by far the largest effect on diet outcome. It generally implies that muscle gain is mostly a matter of eating more food, and fat loss is mostly a matter of eating less food, with all other principles adding less and less to the main effect of calories. Macronutrient amounts are in second place as far as effect on outcome is concerned. Eating the right amounts of protein, carbs, and fats in that order makes an important difference in the quest to getting leaner and more muscular. Nutrient timing comes in at third on the list, but in reality it’s much less proportionately impactful than the first two principles. It can be an important detail and does make a very meaningful difference to those individuals who compete in strength and physique sports. Food composition comes in at fourth place, and is a very small detail of the dieting process. It’s something to be considered when the top three priorities are in order, and probably not before then; the same applies to supplements. As the name implies, “supplements” are meant to supplement an already effective diet, and are nowhere near powerful enough to overcome errors in calorie balance, macros, or timing. When designing a diet, it is imperative to address the bigger picture first. If you do that, you already have a functional diet, and addressing further details only makes it better. The last thing we'd want to do is invest all our time into the details first, and have a diet that's highly labor-intensive but doesn't actually work very well. When building a car, we want a frame with wheels that are connected to a functioning engine... much later should we concern ourselves with the air conditioning and leather seats.

So without further ado, let's look at each dieting principle closely and gain understanding of its impact on diet success. In following our priority list, let's take a look at the equivalent of the engine of dieting: calorie balance.

Chapter 2: Calorie Balance

The single most important variable in determining diet success is calorie balance. In Figure 1 below, its relative importance to the other diet priorities is visually illustrated.

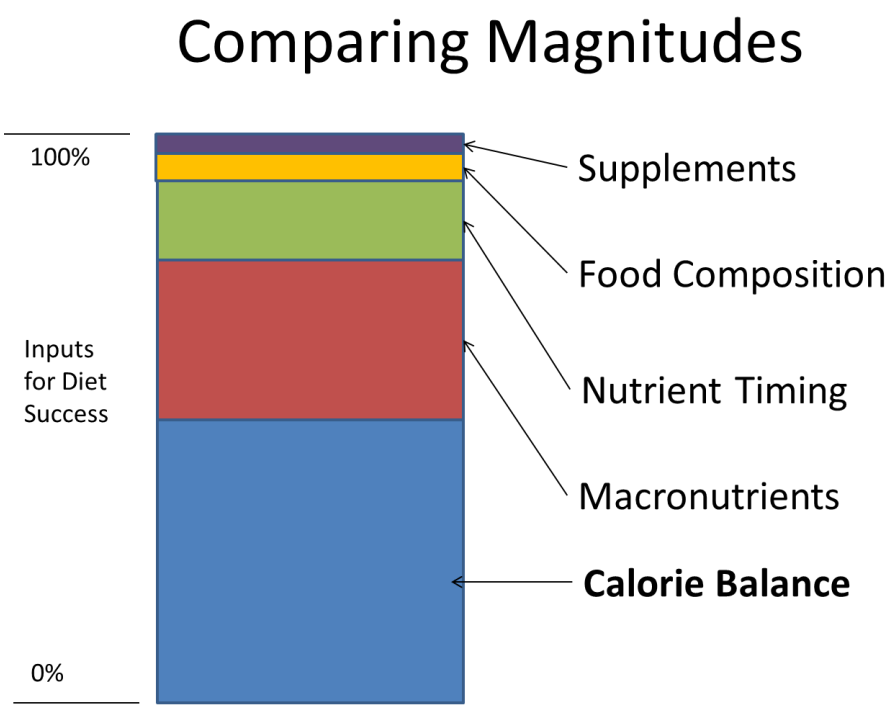


Figure 1: Calorie Balance and the Diet Priorities

Before explaining HOW calorie balance impacts diet, let us first define exactly what "calorie balance" means.

Defining Calorie Balance Precisely

Calorie balance is the ratio between calories taken in and calories expended in any one individual at any given time (usually measured over the course of a week to cancel out most fluctuations). A calorie is a form of energy measurement. Calories can be used (burned) to produce movement and a host of other body functions, consumed from food and drinks, where after they can be used to produce energy right away, or stored for later use. When not stored as glycogen in the muscles and liver (which fill up quickly if excess calories are consistently eaten), excess calories are stored mostly in the form of body fat, and under special circumstances, muscle.

There are 3 states of calorie balance, and they are mutually exclusive. That is, it is impossible to be in any more than ONE state at any time.

a.) Negative calorie balance is the state in which an individual uses (to produce body maintenance,

recovery, and movement) MORE calories than (s)he consumes. Because the calories being used to produce energy for these functions are not sufficiently supplied by food intake, stored calories (in various tissues, such as fat and muscle) must be burned to make up the difference. Because these calories come from the breakdown of body tissues, a negative calorie balance ALWAYS results in weight loss. Even though body water alterations may occasionally mask this loss of tissue, it is always going to occur, with ZERO exceptions so far discovered. The state of negative calorie balance is also known as a *hypocaloric* diet.

b.) Calorie balance is the state in which an individual's intake of calories via food and drink is the same as his expenditure on activities and body processes. Because an individual that is in calorie balance uses all of the calories they consume for some form of body process, their tissue weight will remain stable. This kind of diet is also termed "*eucaloric*." Now of course intakes and activities on any given day are unlikely to be exactly eucaloric, since that would require a supra-human level of precision. But, over the course of weeks and months, eucaloric diets are quite possible. The best indicator of a eucaloric diet? The person stays the same weight for weeks on end. This stability in weight reflects a balance between tissue built and burned and thus demonstrates a eucaloric diet.

c.) Positive calorie balance is a state in which more energy is consumed via food and drink than is being utilized to produce body processes or movement. In this situation, the extra consumed calories are converted into storage forms, the three most common of which are, in order of their prevalence; fat, muscle, and glycogen. Also known as a hypercaloric diet, this caloric balance will ALWAYS result in tissue weight gain. Well unless the first law of thermodynamics is violated, of course. :)

Now that we have the basic terms down, it's time to find out why the heck we're learning them. Is calorie balance important, and if so, how?

How Important Is Calorie Balance?

Calorie balance is THE MOST important variable in body composition diet success for a very simple reason: it has the greatest impact on how much muscle you can gain and how much fat you can lose over any period of time. It has this powerful impact because of the straightforward fact that calories via fats, proteins, and carbs, literally COMPOSE body tissues. That is, before any muscle can be built, the raw materials (calories from protein, for example) quite literally need to be there, as nothing more than building blocks. On the other end, burning fat requires that not enough calories are shuttled into fat cells to keep them the same size as they lose their fat stores when sending them out into the blood.

It is possible that the calories burned from fat stores can be used to help build muscle (the protein that literally composes muscle must still come from the diet, but we'll get to that in the next chapter). In that way, muscle can be built and fat burned at the same time, without needing to go into positive calorie balance for muscle growth or negative calorie balance for fat loss. While this process works well under special circumstances, it becomes less and less likely as the person attempting it becomes leaner and more muscular. That is, the more advanced the athlete, the more calorie balance matters.

If you're lean and muscular enough, your physiology is very offset from what is naturally promoted by your genes. The body allots some effort into building muscle, and some into burning fat, but as muscle grows to new levels and fat stores shrink, negative-feedback loops attempt to bring the body back into homeostasis (a stable and sustainable internal environment) by making further muscle building and fat loss very difficult. This physiological state makes muscle gain without an excess of calories very difficult, just as it makes fat loss without a deficit of calories difficult as well.

A hypercaloric diet not only provides the raw materials for muscle growth, it also facilitates and activates muscle growth via a number of hormonal and intracellular signaling mechanisms. Just the same, a hypocaloric diet not only creates the deficit for fat burning to fill, it also promotes a hormonal and intracellular signaling environment that activates actual fat burning.

Research on the importance of calorie balance in relation to changes in muscle and fat stores is overwhelming, as is the practical experience of almost all lean and muscular athletes (ask a 250lb bodybuilder if they ever had to eat more food than they wanted when gaining muscle, or less food than they wanted during fat loss phases).

So if calorie balance is so important, how do we determine in which 3 of its states we are in, and when?

How to Determine Calorie Balance

In order to maximize our chances for muscle gain or fat loss, we must know when and how to enter a hypo, hyper, or eucaloric state. This is where some of the best news of this book is: all you need is a scale.

We can certainly use a variety of predictive metabolic equations (such as the Harris-Benedict) to get a rough estimate of how many calories create a eucaloric state. In fact we have a table in the chapter on diet design that helps with just that. We can make the process more involved by tracking eating, activity, sleep, stress, and other factors to make the estimate more precise. However, this process can get both overwhelmingly complicated and error-prone. For example, what if you sleep in one day, and your friend gives you a ride to class, skipping your usual walk... do you have to alter your eating by some precise amount? How do you plug that into the equations? Equations are a great way to get started with your calorie balance estimate, but not likely to be of much help in making finer adjustments to a continuing diet.

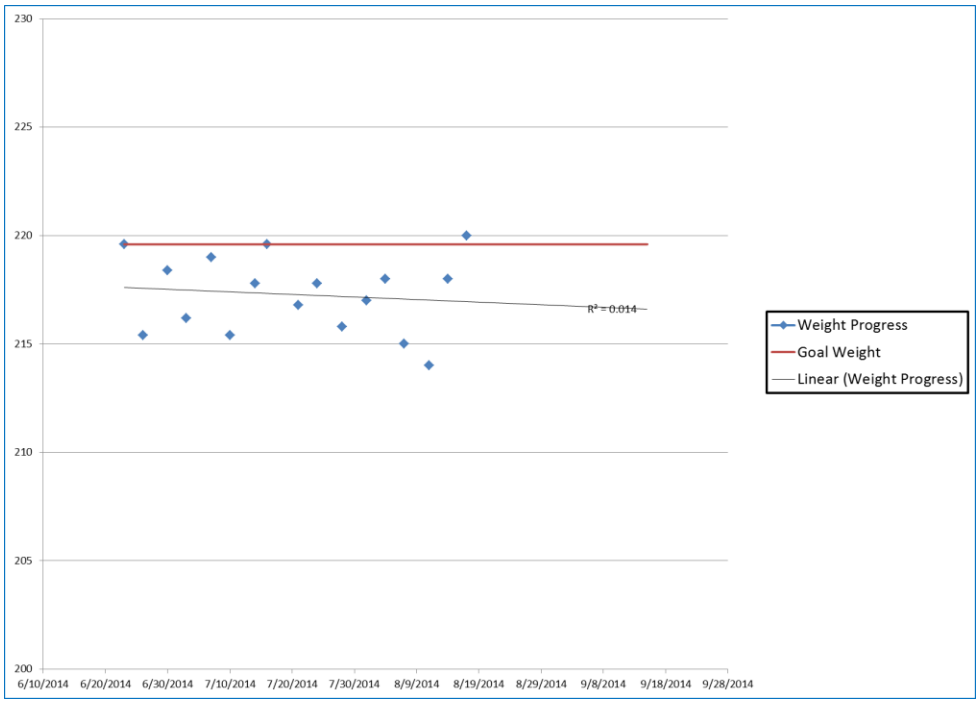
Luckily, a shortcut can be used to avert most of these needless complexities. We learned above that if a diet is truly hypocaloric, it will ALWAYS result in weight loss over the medium and long term. A hypercaloric diet always results in gain, and a eucaloric diet always results in a stable bodyweight. Thus, the easiest (and also completely scientifically valid) way to find out which of the three states you are in is to weigh yourself regularly. Because regular body water fluctuations can account for around 2% of total bodyweight (and more under special circumstances), using daily weigh-ins to alter dietary and

physical activity patterns may be a bit too frequent. What could be seen as tissue loss may really be water loss, and thus an estimate of caloric state can be erroneous. Commercial scales themselves have errors of a pound or so, which adds to the problem. On the other end, using weight data only collected once a week suffers from the same problem... one bad measurement can lead to a miscalculated diet for a whole week! Thus the best way to track bodyweight seems to be about twice a week.

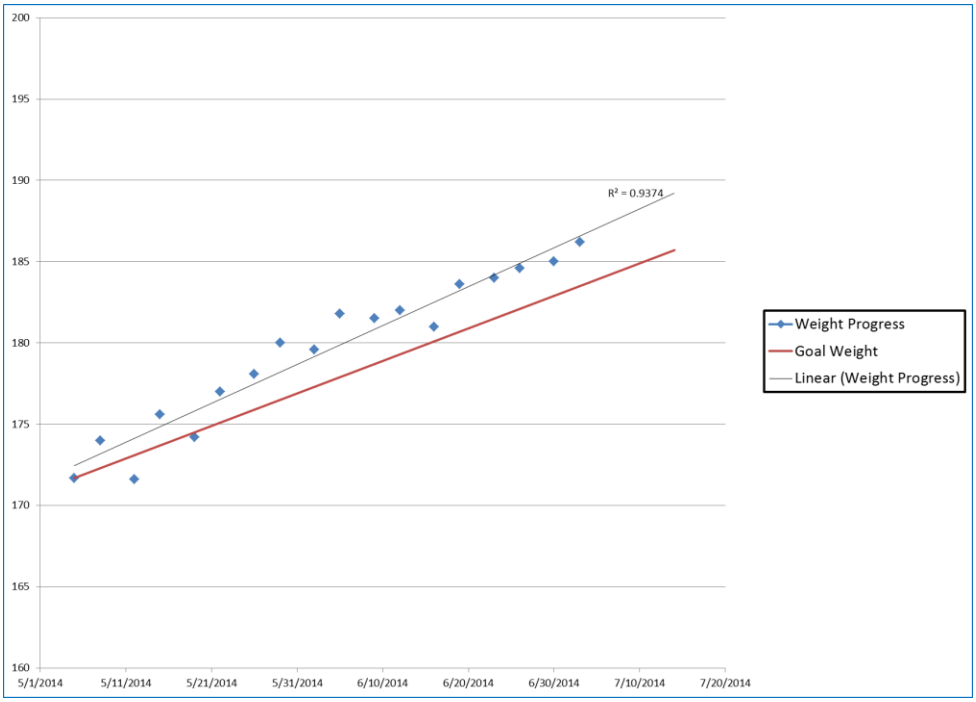
If your twice-weekly bodyweight is oscillating about the same average (holding steady), then you are likely in a eucaloric state. If it's falling, then you're likely hypocaloric, and if it's rising, then you're likely hypercaloric. Because body water alterations tend to occur over several days' time, dietary decisions (whether to increase calories to keep gaining weight, for example) should likely be made only every 2 weeks or so. This time period gives us enough data with which to conclude about tissue changes (not water changes) and thus our caloric state.

To put it simply, if your weight is steadily rising, you're hypercaloric. If your weight is stable, you're eucaloric, and if your weight is steadily falling, you're in a hypocaloric state. It's that easy.

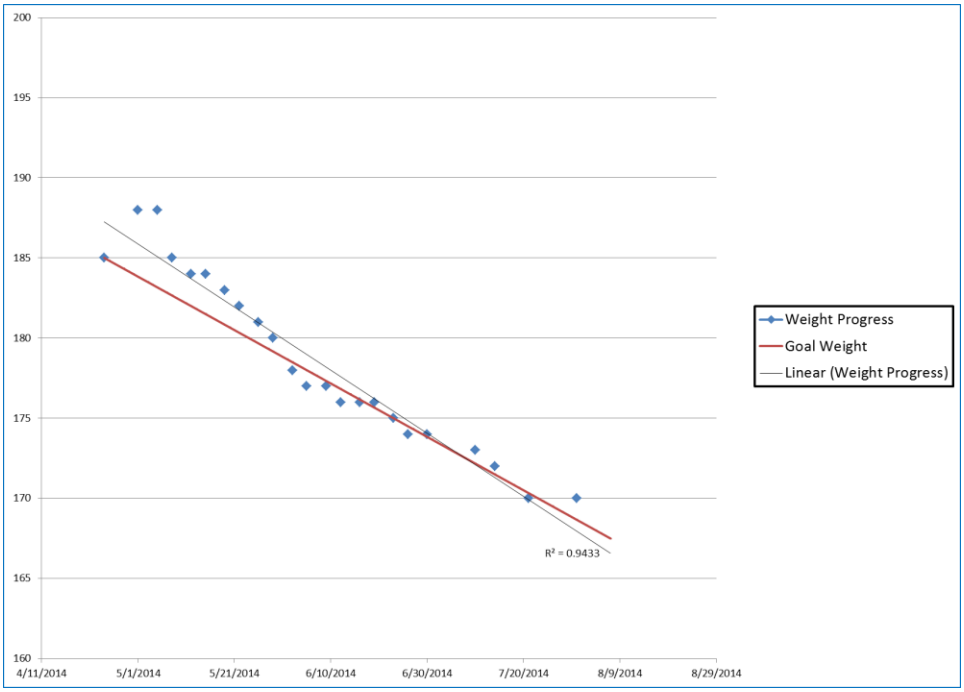
Here are three examples of RP clients in the eucaloric, hypercaloric, and hypocaloric states:



Graph 1: Eucaloric Diet Weight Measurements



Graph 2: Hypercaloric Diet Weight Measurements



Graph 3: Hypocaloric Diet Weight Measurements

Calorie Changes for Muscle Gain and Fat loss

Calorie balance is the most powerful weapon of both fat loss and muscle gain. So if we endeavor to gain muscle or lose fat, how hypercaloric or hypocaloric must we get?

Both research and practical experience have shown that the optimal rates of tissue change seem to be supported by a 1-2lbs (0.5-1.0kg) per week weight loss or gain. These numbers apply to most individuals under most circumstances. Exotic situations and individuals (those weighing below 100lbs and far in excess of 300lbs, for example) may call for different recommendations, to be discussed with a body composition diet coach.

In weight loss, rates of loss much slower than 1lb per week tend to be too slow to be an efficient use of time. After all, why have results in a year that you could have gotten in 6 months? If weight loss is attempted at much greater than 2lbs per week, then lots of fat loss will certainly result, but the percentage of muscle loss is likely to be higher than desired. Since muscle loss is detrimental to appearance and strength, overly aggressive diets may not be desirable to those seeking to enhance body composition.

In weight gain, similar constraints are present as with weight loss. Rates of gain much slower than 1lb per week are simply unnecessarily time consuming. Rates of tissue gain that exceed 2lbs per week are much more likely to cause a disproportionate increase in fat mass relative to muscle mass.

The study of calorie balance revealed long ago that a pound of tissue was, on average, composed of around 3500 calories. That is, to build a pound of extra tissue, around 3500 excess calories must be consumed above the eucaloric state, and losing a pound of tissue demands a 3500 calorie deficit from such a state.

Thus, a good rule of thumb when trying to lose or gain weight is to alter calorie intake (assuming expenditure stays relatively unchanged) by between 500 and 1000 calories per day (which translates to 3500 to 7000 calories, or 1-2lbs of tissue per week). Shoot for around 500 on the slow end of change or 1000 to be on the faster end. However, a combination of increased calorie burning in training *and* a reduction in calories eaten seems to be the best approach in most cases. Rarely should hypocaloric state be generated by diet alone, but rather a combination of diet reduction and exercise increase. In chapter 9, we'll cover personal and on-the-fly calorie adjustment to specific goals in more detail.

Ok, so we've got our calories covered, what's next? Next in order of importance to diet success are macronutrients. Let's take a look.

Main Points and Real World Tips
- Calorie balance is the ratio of calories burned vs. consumed in food - Of all the diet principles for body composition, calorie balance is the most powerful - Muscle grows the fastest on a hypercaloric diet - Fat burns the fastest on a hypocaloric diet - Bodyweight measurements 2-3 times per week are the best indicators of calorie balance - One to two pounds of weight gain per week is best for adding muscle for most people - One to two pounds of weight loss per week is best for burning fat (but not muscle)

Sources and Further Reading:

1.) The calorie deficit required to lose a certain amount of weight:

http://www.ncbi.nlm.nih.gov/pubmed/17848938

2.) Muscle gains slower for those with high bodyfats, muscle loss faster with those of very low bodyfats. Higher energy deficits lead to more muscle loss as a percent of weight loss, higher energy surpluses lead to higher fat gains as a percent of weight gain:

http://www.ncbi.nlm.nih.gov/pubmed/10865771

http://www.ncbi.nlm.nih.gov/pubmed/17367567

3.) Recommendations for Natural Bodybuilding diet preparation:

http://www.ncbi.nlm.nih.gov/pubmed/24864135

4.) General guidelines of intake for strength/power and body composition athletes:

http://www.ncbi.nlm.nih.gov/pubmed/21660839

5.) ACSM Position Stand on Nutrition and Athletic Performance:

http://www.ncbi.nlm.nih.gov/pubmed/19225360

Chapter 3: Macronutrients

Macronutrients are second on our list of highest nutritional priorities, as displayed in Figure 2 below:

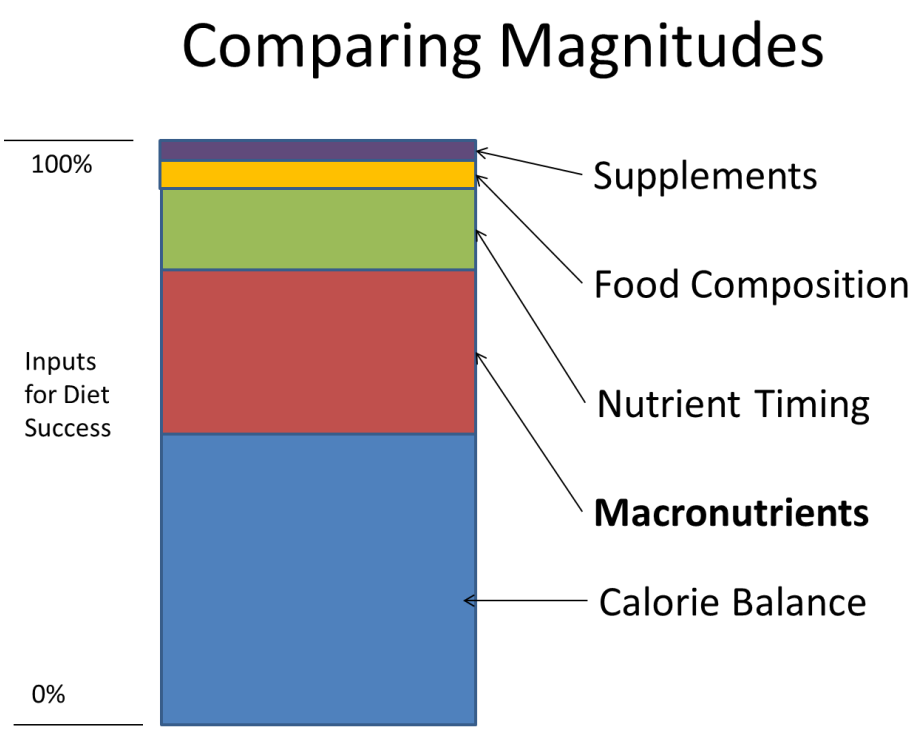


Figure 2: Macronutrients and the Diet Priorities

The Three Macronutrients and What They Do

Other than alcohol (the intake of which those with body composition goals should be minimizing), all calories in the diet come from only three macronutrients:

- Proteins
- Carbohydrates
- Fats

Proteins:
For body composition purposes, the most important dietary macronutrient is protein. It is most important for the sole reason that muscle is literally made out of it. If muscle is the car, protein (or rather, the amino acids that compose it) is/are the metal out of which the parts are built. Protein not only provides the building blocks for muscle growth, it also supplies the amino acids needed to reduce muscle breakdown. In essence, protein both builds new muscle and saves existing muscle from being lost; both functions are very important in maximizing muscle and minimizing fat.

Carbohydrates:
For body composition purposes carbs are the most important dietary macronutrient after protein. If protein is like the metal composing car parts, carbs are like the gasoline. In the body composition setting, the primary role of carbs is to provide energy for the hard workouts that build muscle. During high

intensity activities (such as bodybuilding or powerlifting training, for example), the primary fuel used is a stored form of carbohydrate called glycogen. Glycogen is stored mostly in the muscles that use it (some stored in the liver as well), and is the dominant contributor of energy to hard workouts. If glycogen levels are low, hard workouts become increasingly difficult to complete, and almost impossible to complete with a consistently high level of performance. But the benefits of carbs don't end with glycogen's role in fueling workouts, they also include:

- Supplying the Nervous System with its Preferred Fuel

Carbs (via blood glucose) are the overwhelmingly preferred fuel of the nervous system. Well-maintained blood glucose levels resulting from a diet adequate in carbohydrate allow for optimal nervous system function, which means better muscle recruitment, more fatigue resistance, and even more workout motivation. Much of the fatigue of long duration training is nervous-system mediated, and actually not a result of local muscular factors (legs themselves getting tired, for example). Providing the nervous system with an adequate source of blood glucose is important towards optimizing workout intensity and duration.

- Refueling Glycogen Stores

In addition to glycogen's role as a provider of energy for high intensity workouts, its storage in the muscle plays a role in the regulation of muscle protein synthesis (growth). Low levels of glycogen by themselves have been shown to feed into a signaling cascade which results in the downregulation of muscle growth. That is, just HAVING low muscle glycogen levels, irrespective of training intensity, can damper muscle gain and increase the risk of muscle loss. Since dietary carbohydrate is such a dominant determinant of muscle glycogen, having low dietary CHO can have a direct negative impact on muscle growth.

- Secreting Insulin

When carbohydrates are eaten, insulin is secreted to the proportion of carbohydrate that appears in the blood after digestion (in non-diabetic individuals). The more carbs are eaten, the more insulin is secreted, and vice-versa. Insulin, a hormone secreted by the pancreas, has a profound effect on muscle growth. That is, when insulin is secreted into the blood and binds to target receptors on the muscle cell's surface, a cascade of chemical messengers turn the cell's muscle-growth machinery up to a reflectively large extent. Because of the powerful anabolic effect of insulin, and the fact that carb consumption secretes vastly more insulin than the other macronutrients (fats, proteins), carbohydrate consumption is anabolic to muscle tissue. Carbohydrate grows muscle, especially when amino acids from consumed protein are available as well. Unfortunately insulin is not only anabolic to muscle tissue, but to fat as well. Thus, too much carbohydrate can cause unwanted fat gain, so there can be too much of a good thing. Interestingly, the timing of carbohydrate consumption likely has a small effect on the relative fraction of muscle vs. fat gains, and we'll discuss that in the next chapter.

Fats:
Other than being delicious, dietary fats have several important functions in the body. Essential fats, or fats that cannot be made from converting consumed proteins and carbs, are required for survival. In addition, fats serve as the basis of many hormones and intracellular chemical messengers. If dietary fats drop too low for too long, some unfortunate hormonal alterations may result (decreases in testosterone, for example). But past meeting a minimum intake, fats don't seem to offer much of a body composition

enhancement benefit. However, they have one very important role in body composition alteration: they work as a great calorie buffer.

Fats have a particular combination of properties which make them a great candidate for adding calories to the diet when mass-gaining is the goal:

a.) Palatability
b.) Ease of Consumption
c.) Health Effects
d.) Calorie Density
e.) Price per Calorie
f.) Low Thermogenic Effect

When carbohydrate, fat and protein needs are already met (we'll discuss what those needs are later in this chapter), but our daily calories are not yet filled (imagine needing 5000 calories to gain at the rate you need, but meeting protein, carb and fat needs for health and performance at 4000), we have a choice to make. We need to figure out which nutrients we are going to eat, and in what proportions, to fill in the extra required calories. We can choose just protein, just carbs, or just fats, or any combination of 2 or 3 of the macronutrients, but for the reasons listed above and explained below, adding dietary fat is likely the best course of action under most circumstances.

a.) Palatability:
Fats taste good. As far as most people have determined with their shopping and cooking habits, olive oil, avocado, and grass-fed butter make just about everything taste better. Very few people will complain when you add fats to their diet. When people have a choice between an extra spoonful of natural peanut butter and an extra whole, dry chicken breast, the choice is usually one-sided.

b.) Ease of Consumption:
A large variety of foods can be cooked in olive and canola oils, and avocado seems to mix well with just about any other menu item. Not only are fats delicious, but they're easy to add to the diet. Take your regular chicken, broccoli, and brown rice, and add 3 tablespoons of olive oil. The oil mixes right in and is barely noticeable, but the calorie addition is massive. Some brave souls swear that taking shots of olive oil is just as easy!

c.) Health Effects:
To be discussed more in the chapter on food composition, fat sources heavy in monounsaturated fats are some of the healthiest calories you can take in. Foods high in monounsaturated fats include olive and canola oils, avocado, natural nut butters, and almost all raw nuts including peanuts and almonds. Monounsaturated fats and the foods that contain them have been repeatedly shown to be exceptional for general health, and if calories are controlled, even as large fractions of daily energy intake. It is also possible that healthy sources of particular saturated fats (coconut oil, grass-fed beef products) can be consumed as well, but likely not in the same quantities as monounsaturated fats. While proteins tend to be close to if not as healthy in excess as healthy sources of fat, carbs are definitely not recommended for excess consumption. Excess consumption of carbs in a hypercaloric diet can lead to chronically elevated insulin levels and pre-diabetes, which is both harmful to muscle gains and fat losses as well as general health. Thus, in terms of health effects, if you have to eat more of any nutrient, healthy fats are a top contender.

d.) Calorie Density:
While proteins and carbs have 4 calories per gram, fats contain 9. This alone makes fats a top contender for use as a calorie buffer. Add to this the fact that fats tend to pack together tightly, and the apparent density goes up even further. A tablespoon of olive oil has more calories than an entire banana. And this density is part of the ease of consumption of fats as well... if you're already full but still need more calories to meet your intake goals (a daily struggle of mass-gaining, no less) what's going to be easier, pouring three tablespoons of olive oil on your next meal, or eating three whole bananas?

e.) Cost Effectiveness:
Not only are fats super calorie-dense, they are very competitively priced with other nutrients, especially other healthy nutrients. A large container of olive oil offers a phenomenal number of calories for the price, and certainly beats all protein sources and most carb sources in this metric.

f.) Low Thermogenic Effect:
When eaten in excess, protein and carbohydrate (especially protein) tend to have a high thermogenic capacity. Some of the calories eaten in protein and carbs end up simply being burned off to generate heat, and this can both subvert weight gain goals and be quite uncomfortable (in addition to raising air conditioning costs!). Fats are incredibly easy for the body to digest and absorb, and provide a very small thermogenic effect. Thus, eating more fats will result in slightly more weight gain than eating more carbs and protein, as a larger fraction of the calories will actually be utilized.

Taken together, the 6 points above highly support the role of fats as a default caloric buffer. Once protein, carb and fat needs have been met, extra calories should probably be best consumed by increasing healthy fat intake. But wait a second, what are those particular amounts of proteins, carbs, and fats that meet our optimal needs? Let's take a close look at this topic in our next section.

The Caloric Constraint Hypothesis and What it Implies

Before we can specify the exact amounts, formulas, and ratios of macronutrients, we must first outline a very important idea that governs our selections. This idea is known as the caloric constraint hypothesis, and this is its first formal introduction outside the classroom.

The caloric constraint hypothesis begins with a straightforward premise; that for any particular goal, there is a certain corresponding optimal daily calorie intake. For example, if you are in calorie balance at 2000 calories per day, and you'd like to gain 1lb of tissue per week, around 2500 calories is the optimal daily intake (at least to begin with). Because calorie intake is a set value for any given goal, calorie allotment *constrains* the amount of all 3 of the macronutrients. This is another way of saying that if you eat more of any one of the nutrients (say protein, for example), you must necessarily eat less of one or both of the others (carbs and/or fats) to retain the optimal caloric intake.

Thus, the caloric constraint hypothesis is the statement that increasing or decreasing any particular macronutrient must come at the expense of changing one or both other macronutrients. Why is this realization important? Because it creates a framework to guide our selection of macronutrient amounts and ratios. Because the caloric constraint hypothesis (CCH) does not allow for the stand-alone raising and lowering of macronutrients, we must more closely consider actual physiological needs for nutrients, and rank those needs in order of importance, in order to come up with the most effective diet for body composition alteration.

A quick example of the value of the CCH before we dive into specifying actual nutrient amounts is the question of how much protein one should take in, per day, in order to optimize muscle growth.

Although protein recommendations in the lay literature (forums, bodybuilding magazines, supplement company ads) vary between 1 and 2g per pound of bodyweight per day, an oft-repeated claim is to "get as much protein as you can."

But is more protein always better? If an athlete at ANY given amount of calories eats much more protein than satisfies physiological needs for basic functions, muscle growth, and muscle loss prevention, he will have to cut back on calories from other macronutrients. Cut those calories far enough (by continuing to eat more extra protein), and the negative effects might start to outweigh the positives. For example, if fats are cut too low to accommodate the extra protein intake, a poorer anabolic hormonal environment may result. On the other hand, if carbohydrates are cut too low, glycogen repletion may suffer, and workouts will become less energetic and productive, which will risk muscle mass. Thus, it is by no means a good idea to "always" have more protein. The CCH tells us that for any given calorie intake, there IS something like "too much of a good thing," because the addition of too much of that good thing (protein, in this example) comes at the expense of other "good things" (carbs, fats).

Because of the CCH, we need to find out two pieces of information and use them both to find out optimal macronutrient amounts for body composition alteration:

a.) What the physiological needs are for all 3 macronutrients
b.) How important these needs are in a ranked order of priority

The first piece of information establishes the basic amounts of nutrients we can work with. The second allows us to adjust those amounts to accommodate the needs of the other nutrients, based on their level of impact (priority) on body composition.

For each of the macronutrients (proteins, carbs, fats), we're going to provide 4 different pieces of information:

a.) Importance of the nutrient compared to other two
b.) Minimal intake (one for general health, one for body composition alteration)
c.) Excessive Intake (one for general health, one for body composition alteration)
d.) Optimal intake value in a eucaloric diet (given a-c)

Meeting Protein Needs

a.) The Relative Importance of Protein Intake:

Protein supports muscle growth by literally providing the building blocks out of which muscle structure is made. Because of this dietary protein intake is THE MOST important of the macronutrients in terms of body composition. If you only consider ONE of the macros, it had better be protein.

b.) Minimum Daily Intake:

Minimum daily protein for health (not maximum muscle mass) is covered with a diet of 0.4g protein per pound bodyweight per day. That means a 200lb lifter would be eating around 80g of protein per day.

You might think that sounds a bit on the low side, and for building and retaining muscle, indeed it is. Research has shown that athletes interested in maximizing muscle mass do in fact need considerably more protein than this.

The minimum daily intake for body composition is higher than the amount for health. For athletes on a serious mission to gain muscle, keep muscle, and lose fat without risking excessive muscle loss, a likely minimum daily protein intake is around 0.6g per pound of body mass. That means a 200lb lifter would be consuming around 120g of protein per day. Now, this is the approximate *minimum* amount that can remotely claim to effectively support muscle growth and retention. Any amount less than this will likely seriously undercut the results of any diet and training program. Now, this number is the absolute minimum, and is only enough protein under several likely conditions:

- Very good genetics (those with good genes for muscle growth and retention can get good results from minimal amounts of protein)

- Drug use (anabolics enhance the feed efficiency of protein, which means more of the eaten protein than usual is used to save and build muscle)

- A very hypercaloric diet (if you eat TONS of carbs and fats and are always hypercaloric, your basic energy demands are met by those macros, and most protein can be used to spare and build muscle)

- Protein timing (if you eat 120g of your daily protein grams all in one meal, about 5-8 hours later, you'll begin to lose muscle, and won't stop until the next day when you get to eat protein again. If on the other hand you spread your protein out to 4 even meals every 4 hours or so, you can provide a consistent stream of amino acids to muscle, and the likelihood of muscle loss drops significantly)

If you don't meet any one of the above criteria (humorously, the first criterion may be tough to admit), then the "minimal for body comp" amount may in fact be too little protein. If you're a drug free athlete with good genetics and a real-world job where eating every 3 hours is not always possible, and you're in a fat-loss phase, it's highly unlikely that 0.6g per pound of body mass is enough protein for your needs. In reality, your minimal protein needs for body composition may lie closer to the "optimal" values discussed in section d.

c.) Excessive Intake

Athletes who have been cleared by their physicians as having no organ health or metabolic problems *do not* have an "excessive" upper limit to their protein intake. That is, short of kidney dysfunction and a small list of other conditions, it's very unlikely that eating too much protein is deleterious to general health. The research on this is expansive and conclusive. If you weigh 200lbs, are healthy, train hard and eat 400g of protein per day, the only conclusive effect of that dietary regimen is a very fatigued jaw musculature.

For body composition, there IS such a thing as excessive protein intake precisely because of the caloric constraint hypothesis (CCH). Once you've met the optimal protein intake (to be discussed next), any protein in excess of that amount could instead be carbohydrate. More carbohydrate can replenish glycogen more completely, give more workout energy via blood glucose, or provide an independent (insulin-mediated) anabolic stimulus. So if you have to cut your carbs to 100g per day just to make room for the pounds of protein you eat, you're trading away net benefits of carbs for no added benefits of

extra protein. Because in very technical terms, any protein amount over the optimal value is considered excessive, in reality that is in fact the case. However, the optimal protein intake is much more a range than it is an *exact* amount, and there is some uncertainty as to its application in ALL circumstances. Therefore, the likely "excessive" ceiling of protein intake for body composition is around 1.25g of protein per pound body mass. This means that our hypothetical 200lb lifter can consume up to about 250g of protein per day. Anything over that on a hypocaloric diet may risk a needless drop in carbohydrate intake (that will hurt overall results), and anything over than that on a hypercaloric diet may needlessly ignore the benefits of added healthy fat consumption (see the discussion of fat intake in the first part of this chapter).

d.) Optimal Intake

Literally hundreds of studies have been published on optimally meeting protein needs for athletes. These studies have been conducted on a wide range of sports, including powerlifters, weightlifters, bodybuilders, and recreational lifters. Pooling all of the literature together leads us to the tentative conclusion that the optimal daily intake of protein is somewhere in the range between 0.8 and 1g per pound of body mass for those hard-training individuals that are looking to enhance body composition. This means our 200lb athlete would be consuming between 160 and 200g of protein per day. It turns out that some old-school bodybuilding wisdom is indeed true, and forms a great and simple rule of thumb for those of us interested in body composition success: 1g of protein per lb of bodyweight per day is a great starting point in most diets. Any intake that strays too far away from this value is likely also straying away from the highest margins of success in building muscle and sparing muscle while burning fat.

Meeting Carbohydrate Needs

a.) Relative Importance of Carbohydrate Intake:

Only secondary to protein intake, carb intake comes in next in our order of macronutrient priorities. With inadequate levels of carbohydrate, 3 distinct outcomes become more likely:

- A decrease in single-session motivation and effort due to inadequate blood glucose levels holding back the nervous and muscular system
- A decrease in single and multi-session performance due to chronically low muscle glycogen levels
- A direct decrease in muscle growth due to decreased hypertrophic signaling from lack of insulin secretion and chronically low muscle glycogen levels

In order to optimize our dietary program, once protein needs have been addressed, carbohydrate needs must be examined. Let's take a look at what minimal, excessive, and optimal intakes of carbohydrates are from both a health and body composition perspective.

The intake of carbohydrates can be based on a variety of factors. In order to figure out *exactly* how much carbohydrate needs to be ingested, very invasive measurements of energy expenditure and fuel utilization must be done. However, through the use of research on athletic populations in combination with years of practical experience with body composition coaching, just two pieces of information can be enough to form a valid basis for carbohydrate intake: body weight and training volume.

To make carb intake estimation simpler, we've divided training into 3 different types by training volume.

They also roughly correspond to the three basic phases of powerlifting periodization (peaking, strength, hypertrophy):

Light workouts:
- Less than 5 reps per set on average
- Less than 6 working sets for compound lower body moves
- Less than 10 working sets for compound upper body moves or any isolation moves

Moderate workouts:
- Sets of 5 reps per set on average
- 6+ working sets for compound lower body moves
- 10+ working sets for compound upper body moves or any isolation

Hard Workouts:
- Sets of 10 reps per set on average
- 6+ working sets for compound lower body moves
- 10+ working sets for compound upper body moves or any isolation

For each of the above workouts, a certain level of carbohydrate intake is appropriate for body composition goals. Body mass must also be factored in. In order to integrate body mass, we must take a separate look at the minimal, excessive, and optimal intakes of carbs per day.

b.) Minimal Intake:

Carbohydrates are not an essential nutrient in the technical sense (your health will not deteriorate in their absence), so they don't actually have a true minimum from the perspective of general health.

From the perspective of body composition, chronically dipping too low in carbohydrate intake can lead to poor acute workout performance (via blood glucose and glycogen insufficiency), poor direct and indirect muscle growth (via glycogen, training intensity/volume and insulin-based signaling), and uncontrolled expansion of accumulated fatigue over days and weeks (due to glycogen depletion). Thus under most circumstances, if the minimal values in the table below are not met, especially for extended periods, a suboptimal body composition is likely.

Minimal Daily Carbohydrate Intake Guidelines

Non-Training Days	As low as 0g per lb*
Light Workouts	0.5g per lb*
Moderate Workouts	1.0g per lb*
Hard Workouts	1.5g per lb*

* per pound body mass per day

Now, under special circumstances (getting into bodybuilding competition shape, for example), daily carbohydrate intake can be dropped below these values with net beneficial effects, especially if the decreases are short-run (several days or weeks, not months). However, for most situations, these minima are useful to keep in mind when designing a diet for your body composition goals. Going below these values consistently will usually result in needless muscle loss, which of course negatively impacts both appearance and performance.

c.) Excessive Intake:

Before discussing the impact of excessive carbohydrate intakes on health, it must be noted that for active individuals of a healthy bodyweight, there does not seem to be such a thing as an excessive intake of carbohydrate, so long as minimal protein and fat intakes are met, and calories are not in surplus. Endurance runners and individuals with vegetarian lifestyles illustrate quite clearly that diets very high in carbohydrates can be very healthy in the long term.

However, there is such a thing as too much carbohydrate intake in relation to health for a certain category of individual interested in optimal body composition and sport performance. For heavier individuals (women over 175lbs and men over 225lbs) that are either maintaining their weight or trying to gain weight, the requisite daily calorie intakes can be quite high. After protein has been consumed to at least the minimal value, the rest of the calories can come from either fats or carbs. For such individuals as described, carbohydrate intakes above the "excessive" values (see table below) increase the likelihood of chronic hyperglycemia and hyperinsulinemia. This state predisposes the individual (especially after months) to a decline in the insulin sensitivity of muscle tissue (fat tissue retains insulin sensitivity for longer). Thus, with any ingestion of nutrient in such a state, muscle growth and retention becomes less likely and fat gain and retention becomes more likely, as fat is now proportionately more sensitive to the anabolic effects of insulin than is muscle. This state also carries with it the health problems of the pre-diabetic condition. Thus, the values for "excessive" carb consumption, especially for larger individuals and those seeking to gain weight, is the same for health as it is for body composition (see table below).

For body composition, like health, too much carbohydrate over long periods of time decreases the insulin sensitivity of muscle more so than fat. This not only leads to a high chance of fat growth, but also a lower chance of muscle growth. Of course the guidelines in the table below are simply averages, and were formulated with the athlete interested in body composition in mind. Athletes engaging in high-volume endurance activity have significantly higher "excessive" values for daily carbohydrate intake.

Excessive Daily Carbohydrate Intake Guidelines

Non-Training Days	More than 1.0g per lb*
Light Workouts	More than 1.5g per lb*
Moderate Workouts	More than 2.0g per lb*
Hard Workouts	More than 2.5g per lb*

* per pound body mass per day

d.) For health, any carbohydrate intakes appropriately paired to training volumes and below the excessive values for daily consumption are appropriate.

In the realm of body composition, the following table (see below) summarizes the AVERAGE starting point for someone seeking to take in an optimal daily amount of carbohydrate. This amount provides enough carbohydrate to support training volume and intensity, anabolism, and anti-catabolism, yet is not so much as to risk the development of insulin resistance and impinge on future hypertrophy.

Optimal Daily Carbohydrate Intake Guidelines

Non-Training Days	Less than 0.5g per lb*
Light Workouts	1.0g per lb*
Moderate Workouts	1.5g per lb*
Hard Workouts	2.0g per lb*

* per pound body mass per day

Meeting Fat Needs

a.) Relative Importance of Fat Intake

Fat is an essential nutrient that must be consumed in at least the minimal quantities for health and body composition. However, once those minima have been met, fat becomes the least important nutrient of the 3 macros. It does not provide the predominance of energy for hard workouts, it doesn't directly support recovery and anabolism, and it does not form the building blocks of muscle tissue as do carbs and protein. For this reason fat intake is the most widely manipulated macronutrient in a diet, and so long as the minima are taken into consideration, a wide range of fat intakes is dictated by the dietary goals.

b.) Minimal Intake

Pinning down the minimal intake of dietary fats for health and body composition is not as straightforward as it is for protein or even carbohydrates. However, based on an examination of several lines of literature, an approximation of 10% of an individual's bodyweight in pounds (converted to grams of fat per day) is likely a good starting point. This means that a female weighing 100lbs would need to consume at least 10g of fats per day to remain healthy and optimize her body composition, while a male weighing 250lbs should go no lower than 25g of fat per day for extended periods. In special circumstances, such as the final weeks before a bodybuilding show, these minima may be disregarded, but this should not be done over the long term as a sustainable strategy for health and body composition.

The minimal intakes of fats are derived from their roles as components of joints, cell membranes, multiple hormones and intracellular messengers, and other structures. While most fat can be synthesized from ingested protein and carbohydrate, some fat cannot, and is termed "essential," thus needs to be consumed in the diet.

If minima are consistently not met, hypertrophic pathways (which involve fat-based steroid hormones as well as intracellular signaling molecules) are likely the first to be affected, resulting in suboptimal muscle growth (on a massing phase) and retention (on a cutting phase). Eventually, health problems not related to body composition will also arise from insufficient fat intakes. But why go that far and risk so much

muscle? Staying above the minima should be possible for almost all individuals under almost all circumstances, in large part because the calorie contribution of this fat intake is so small (only 90 calories for the 100lb person and 225 calories for the 250lb person).

c.) Excessive Intake

So long as calories are controlled, and protein and carb minima are met, there is no established or even hypothesized excessive intake of fats in the diet. As a matter of fact healthy fats (to be addressed in detail in the chapter on food composition) can be consumed in very large quantities, and probably larger quantities than protein or carbs, without posing a risk to health or body composition. Fats don't even remotely stress the kidneys (as is the mostly unfounded concern with excessive protein intake) and have almost no effect on insulin secretion (as a matter of fact, they have a down-regulating effect on insulin secretion which may be of net benefit to health and body composition). Thus, so long as calories, proteins, and carbs are in line, fat intake has no true excessive value.

d.) Optimal Intake

Similarly to the discussion on excessive intake, the optimal intake of fats is not a definite term. So long as protein and carb amounts are being met, and calorie intakes are estimated for a particular goal, the "optimal" intake of fat becomes whatever amount fills the gap in calories between protein and carb intake and the requisite calorie amount.

Now that calorie, protein, carb, and fat amounts have been discussed, the next most important consideration in a diet tailored for body composition is the principle of timing of those nutrients in any one day or over a period of several days.

Main Points and Real World Tips
- Protein is the most important macronutrient for muscle gain and retention - About 1g of protein per pound of body weight is best for most people - Carbs are secondary to protein but very important to fueling and recovering hard workouts - Higher carbs should be eaten with higher workout volumes and daily activity levels - Healthy fats are needed in small amounts for health and hormonal function - Healthy fats are the main macro added during massing phases and removed during cutting

Sources and Further Reading:

1.) Protein needs for various athletes:

http://www.ncbi.nlm.nih.gov/pubmed/18577776

http://www.ncbi.nlm.nih.gov/pubmed/23107527

http://www.ncbi.nlm.nih.gov/pubmed/22150425

2.) Adequate carbohydrate feeding preserves muscle during dieting, low carbs cause negative effects:

http://www.ncbi.nlm.nih.gov/pubmed/21558571

http://www.ncbi.nlm.nih.gov/pubmed/20489032

http://www.ncbi.nlm.nih.gov/pubmed/22674476

3.) Carbohydrate and fat intakes for athletes:

http://www.ncbi.nlm.nih.gov/pubmed/11310548

http://www.ncbi.nlm.nih.gov/pubmed/14971430

4.) Large dietary fat reductions negatively affect anabolic hormone levels:

http://www.ncbi.nlm.nih.gov/pubmed/6298507

http://www.ncbi.nlm.nih.gov/pubmed/6538617

5.) General guidelines of intake for strength/power and body composition athletes:

http://www.ncbi.nlm.nih.gov/pubmed/21660839

6.) Recommendations for Natural Bodybuilding Diet preparation:

http://www.ncbi.nlm.nih.gov/pubmed/24864135

7.) ACSM Position Stand on Nutrition and Athletic Performance:

http://www.ncbi.nlm.nih.gov/pubmed/19225360

Chapter 4: Nutrient Timing

Nutrient Timing is third on our list of highest nutritional priorities, as displayed in Figure 3 below:

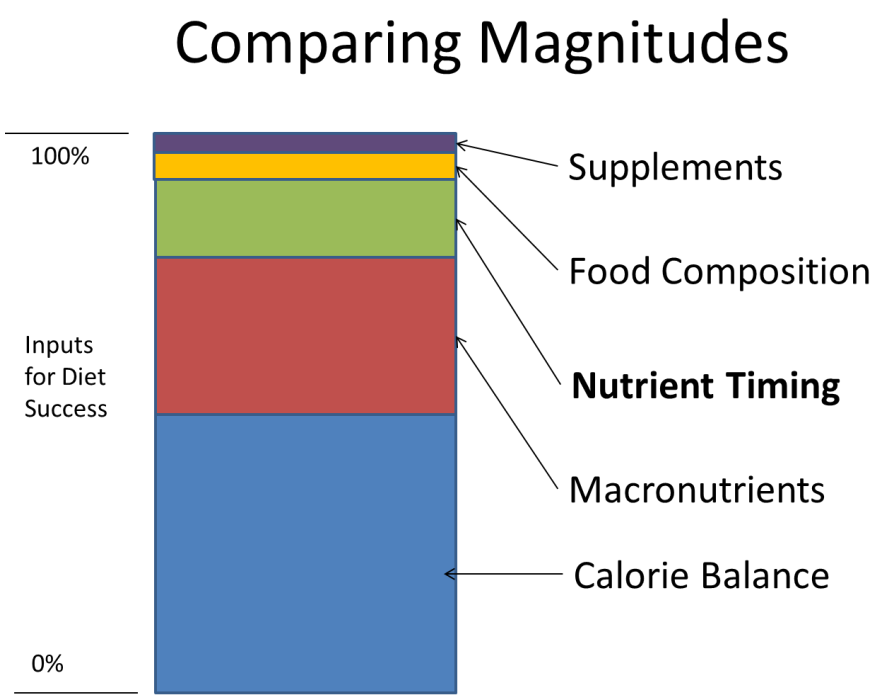


Figure 3: Nutrient Timing and the Diet Priorities

Defining Nutrient Timing

A very common topic of discussion in the fitness community, and one that has always been (and is especially lately) controversial, is nutrient timing. Before discussing how powerful nutrient timing is, it will be useful to first define the term in detail.

In its most general sense, nutrient timing asks the question of WHEN to take in nutrients on any given day. This general definition can be broken down into two distinct subdivisions:

a.) Meal Frequency
b.) Timing in Relation to Activity

Questions of nutrient timing can be split into a question about how many meals per day should be consumed, and also if those meals should be timed in any special way around periods of training, activity, and rest.

To break down nutrient timing even further, all 3 macronutrients can be assessed in both the realms of frequency of intake (should fats be taken in 6 times per day, or is 2 times better, for example) and timing to activity (does eating protein right after training grow more muscle than waiting 2 hours to eat

protein).

Because of these sub-definitions, in the following sections we'll be taking a look at the timing of each of the macronutrients separately, and with each one we will consider both its frequency of ingestion and its timing to activity.

Before we go into the details of nutrient timing (starting with protein timing), it's important to keep in mind where in the order of priorities in body composition nutrition nutrient timing lies. The answer is of course in 3rd place, behind calorie balance and macronutrient amounts, but the reality is that the first two priorities are much more powerful than nutrient timing in their effects on body composition. A deviation from optimal calorie balance can make or break a diet goal. A deviation from macronutrient amounts, especially protein intake, can seriously hinder goals. But a deviation from optimal timing will only have at most a small effect on the results of a program. So long as you get your calories and macros right, timing is a much smaller concern, responsible for at most about 20% and possibly as little as 10% to the total impact of a diet plan.

Now, before we just abandon timing outright, it's helpful to think of what kinds of individuals will benefit from it. If a person has a very busy schedule and modest body composition goals, timing may not need to be a big concern. But if you can make time to eat around your schedule, and you have a powerlifting meet or bodybuilding show coming up, then a 10% enhancement in your diet progress is WELL WORTH the timing effort. How many people feel comfortable giving up 10lbs of total on the platform or dropping from 1st to 5th place in a bodybuilding show? A more extreme but nonetheless apt example is that of national level or Olympic sport competition. In these competitions, the difference between a gold medal and not making the podium can be as little as 2% of performance. All of your competitors are doing everything they can to win, and they're all very good. If you want the best possible results, timing should likely be a consideration.

Protein Timing

Meal Frequency:

The summary of the evidence on protein feedings and the basic physiological understandings of muscle metabolism reveal a very likely understanding... muscle is a dynamic tissue that constantly both grows and shrinks at all times of the day and night. Both muscle loss and muscle growth occur slowly and in continual curves. As such, it is very likely that a near-constant supply of amino acids from the GI tract is beneficial to support both muscle growth and maximally avert potential muscle loss.

The body has an ability to store dietary fat (adipose tissue) and even carbohydrate (liver and muscle glycogen), but it does not have the ability to store excess consumed protein. Muscles grow at a certain rate, and that rate is not powerfully altered with large ingestions of protein. That is, eating 5x the amount of protein you usually do won't make your muscles absorb that much more protein and use it to build muscle. As a matter of fact, the average research study reveals only a small increase in muscle

growth with high protein feedings.

On the other hand, if no amino acids are coming in through the GI tract, muscle still takes up amino acids at a similar rate in order to build, replace, and repair its components. If aminos are not coming from the GI tract, they'll be taken from the next-best reserve of aminos in the body... other muscle tissue. This isn't a great thing from the perspective of maximizing muscle growth and retention, as breaking down one muscle to grow another and vice-versa is hardly a sustainable growth-promoting process. It seems that in order to maximize muscle growth (on a massing phase) and retention (on a cutting phase), a relatively constant supply of amino acids must come from the GI tract.

If we assume this to be the case, the next logical question is what sort of meal frequency allows for a continual supply of amino acids (from digested protein) into the bloodstream? The answer is... it depends! But luckily, we know what it depends on, which is digestion rate of the consumed proteins. Digestion rate depends on 3 factors:

a.) Protein Type
b.) Meal Size
c.) Fat and Fiber Content

Let's take a look at each one:

a.) Protein Type:

Proteins vary in their digestion times based simply on the source. The fastest digesting proteins seem to be whey fractions, which can clear the GI tract (complete absorption into blood) in under an hour.

Whole food proteins are next in line, which includes (but is not limited to) most kinds of chicken breast, lean beef and fish. These proteins take several hours (by themselves) to absorb from the GI tract, releasing a steady stream of amino acids into the blood the whole time.

Last on this spectrum are dairy products, particularly because of their casein content, with studies showing that casein proteins form a globular bolus in the stomach and slowly digest over the course of up to 7 hours.

b.) Meal size:

Because the stomach and intestines (and all other digestive organs) are capable of digestion rates only so fast, the simple addition of more food can prolong the digestion time of any protein sources in that food. Consuming a whey protein shake of 25g can mean total digestion within the hour. Consuming that same shake with 1000 calories of ice cream can allow that whey protein to contribute amino acids to the blood for *hours* to come. Even more protein itself (an 8oz steak vs. a 4oz steak) can delay absorption times.

c.) Fat and Fiber Content

Related to meal size, and often contributing to it, dietary fats (mostly) and fiber (less so) can have a profound effect on the digestion and absorption rates of co-ingested proteins. Both fat and fiber can delay and prolong the digestion of proteins to a considerable extent. For example, a large, fatty steak can take as long to digest as a casein source (longer than 7 hours).

Thus, because of the high variance in digestion rates, a number of daily meal frequencies can be sufficient for providing the needed continual amino acid supply to the blood. Any meal frequency above 3 meals per day, if enough fats, fibers, and calories are eaten with the lower-frequency meals, can be sufficient. Meal frequencies lower than 2 meals per day are unlikely to supply a continual stream of aminos into the blood and should probably be avoided. Additionally, from a practical perspective, when calories drop, especially towards the end of a fat-loss phase, the drop in ingested total food and fat amounts likely increase the need for higher-frequency feeding, as the now faster-digesting proteins will clear the blood more rapidly.

In order to support continual levels of amino acids in the blood, the meals eaten should also be separated relatively evenly during the day, with a meal consumed upon waking, several meals through the day, and one consumed prior to bedtime to maintain amino acid levels through the night.

Protein Timing to Activity:

Unlike meal frequency, the research supporting protein timing to activity is not quite as impactful. So long as protein is consumed in a sufficient amount and consumed in such a way as to continually supply the bloodstream with amino acids, the timing of protein to activity is a very small concern. There are some considerations to draw about protein consumption around workouts, especially hard, high-volume hypertrophy sessions.

Having amino acids in the blood during hard training likely prevents muscle catabolism (breakdown) to some extent. But because a protein source like steak or chicken is difficult to digest and may cause GI distress if present in the gut during intense and voluminous physical activity, a protein that is easy to digest might be of more utility. Thus, whey protein, with its easy and fast digestion, is a good candidate for an intra-workout protein source especially in the small quantities needed to stave off catabolism.

Post-workout, research has shown that protein feeding can blunt catabolism and promote anabolism, especially in the several hours after training. These short term metabolic fluctuations are not big effects in the grand scheme (as most muscle growth occurs in the days after training, not several hours), but they may matter to a small extent. Thus, in order to speed the delivery of amino acids to the muscle after training, a whey protein supplement can be used as soon as training has concluded (or even consumed towards the end of training if possible).

Lastly on timing to activity is the consideration of amino acid levels during sleep. Especially on a hypocaloric diet when large meals high in fat and fiber are not available, a protein source that can digest slowly over the course of many hours may offer an advantage. In this application, as casein protein product may be a good choice, to be consumed before bedtime, in order to supply muscle with amino acids during sleep.

Carbohydrate Timing

Meal Frequency:

Because the primary consideration for meal frequency is amino acid availability, carbohydrate feeding frequency is much less important, whereas its timing is more important. Carbohydrate feeding frequency is not generally an issue until the higher ends of carbohydrate intake are considered. At the highest levels of carb intake (and concomitantly high training volumes), it becomes both impractical and impossible (from an absorption and assimilation perspective) to load glycogen from feedings that are too large. Carbohydrate feedings that are too large to be synthesized as glycogen (exceeding the rate of about 0.75g per lb of carbohydrate per hour) will be deposited more as fat tissue and net glycogen replenishment will suffer. Thus, in times of high training volumes and especially for multiple daily training sessions, it's prudent to spread carbohydrate consumption into multiple feedings to avoid exceeding maximal rates of glycogen synthesis.

Carbohydrate Timing to Activity:

The literature on timing carb intake to activity is quite vast in scope and quite comprehensive. There appear to be special considerations to carbohydrate consumption at 5 distinct windows of activity:

a.) Pre-training
b.) During-training
c.) Post-training
d.) Post-post training
e.) All other times including non-training days

Let's take a look at each specific timing consideration and examine both how and why special carbohydrate intake recommendations are warranted.

a.) Pre-training

The pre-training meal has several important functions that contribute to enhanced body composition, and the carbohydrate within that meal is of central importance to these functions. The pre-training meal, and particularly the carbohydrate it provides, helps to top-off glycogen stores, supplies blood glucose for muscle contraction as well as nervous system activity, and is also anti-catabolic in the earlier phases in a workout. Let's look at these effects briefly:

- Glycogen is typically replenished mostly in the hours and days after the last time a particular muscle group has been trained. However, several days between training the same muscle group can lead to a small amount of glycogen depletion, for example via walking in the legs and performing daily tasks for the upper body. Because repeated high intensity efforts of weight training benefit highly from fully (or as close as possibly under the circumstances) glycogen stores, a pre-workout meal containing carbohydrates can top off glycogen stores to a small extent, and allow for better workout performance.

- Although most of the energy for weight training is provided by the breakdown of stored muscle glycogen, blood glucose does provide a small component. In order to maximize training intensities and volumes during a session, normal levels of blood glucose should be present, and can be consumed via pre-workout carbohydrate, which should provide adequate blood glucose unless the sessions are very voluminous.

- The nervous system can experience a great deal of fatigue during a lengthy, intense and voluminous training session. This fatigue has in fact been shown to limit performance, in some cases before local factors (the actual muscle being used) themselves. Because the nervous system greatly prefers carbohydrate as its dominant fuel source, it does not perform nearly as well if only protein and fat are available. Thus, for the purpose of reducing neural fatigue and thus performance limitation, pre-workout carbohydrate can be used.

- While the training process is itself anabolic, the actual training session (the chemical and hormonal environment during the session itself) may be considerably catabolic. Training itself can burn muscle. One method of preventing this is to make sure blood amino acids are plentiful. Another method of preventing muscle loss during training itself is ingested carbohydrate. Carbohydrate has been shown to have significant muscle-sparing effects, especially when ingested before training, likely making this a desirable practice from the perspective of enhanced body composition.

The amount of carbohydrate ingested pre-training can vary, but we'll assume here for the sake of simplicity that all other nutritional practices are being followed. Because carbs are generally paired to training volumes and body sizes, our pre-training meal of carbs is paired to training volumes and per-meal protein content. Please see the table for details.

Pre-training Carb:Protein Ratios

Light Workouts	1:1*
Moderate Workouts	1.5:1*
Hard Workouts	2:1*

* ratio of carbs to protein in the pre-training meal

The timing of consumption of the pre-workout meal ranges between 1 and 3 hours before the training session itself. This actually depends on the fat and fiber content of the food, as well as the glycemic index of the carb consumed (glycemic index to be discussed in detail later), but it also depends on the personal tolerance of the athlete and the difficulty of the session. More difficult sessions may not be

compatible with recent meal ingestion, as that may lead to GI distress and possibly vomiting, so pre-workout meals for hard workouts should usually be consumed on the early end of the 1-3 hours before training range.

b.) During-training

Consuming a meal *while training* was a practice adopted from endurance athletes by physique athletes and those interested in maximizing their body composition. With the very long and voluminous training sessions of endurance athletes, intra-training nutrition has been overwhelmingly demonstrated as effective and has been adopted my most high level endurance athletes.

In training for body composition, the consumption of carbohydrate and protein during training elicits similar benefits as it does in endurance athletes. However, these benefits are especially high during hard training sessions and are likely negligible in light training sessions, especially if the recommended pre-training nutrition is followed.

The benefits of intra-training consumption are very similar to the benefits of pre-training consumption. Intra-training consumption of carbs (particularly) and protein results in a high use of blood glucose for fueling activity (and thus a possible sparing of glycogen, which can be important during a fat loss phase). These carbs also supply fatigue-stalling glucose to the CNS (central nervous system), and blunt the muscle catabolism of high volume training to some extent.

The recommendations for intra-training are based on protein intake and training volume/intensity, but because workouts don't tend to last a whole meal-cycle (total average time between meals, or 3-5 hours), only half the usual per-meal protein consumption is used. That is, if someone consumes 40g protein meals, the intra-training shake should contain only 20g of protein. Please see recommendations in the table:

Intra-training Carb:Protein Ratios

Light Workouts	2:1*
Moderate Workouts	3:1*
Hard Workouts	4:1*

* ratio of carbs to protein in the intra-training meal

The timing of the intra-workout shake is rather straightforward. For the contents to be available in the blood at the end of the hard workout (when the pre-workout meal is no longer contributing much or at all), the intra-workout shake consumption must commence at the onset of the workout, and be finished during or right after the workout is over. That way, the intra-workout shake can actually contribute to a beneficial post-workout nutritional environment, which will be addressed thoroughly in the next section. It must be noted that the benefits of the intra-workout shake are likely maximized with an easy and fast digesting protein and carbohydrate source, as well as minimal fat and fiber since delays in digestion would turn this shake into a post-workout shake and negate any intra-workout benefits. Slow or difficult to digest foods also pose the risk of GI distress during training and should be avoided for that reasons as well.

While the benefits of the intra-training shake are meaningful for hard and possibly moderate workouts, their beneficial effects on light workouts are far from clear. On the balance of the evidence, the intra-workout shake may be forgone on light and possibly moderate workouts without a likely detriment to

long-term enhancements in body composition.

c.) Post-training

The practice of consuming a post-workout shake high in carbohydrates and moderate in protein is relatively long-standing. The evidence for beneficial effects of this practice is well established, and several likely mechanisms are involved. These mechanisms include anti-catabolism, glycogen repletion, and the activation of anabolic machinery. Let's take a look at each one in depth.

- Anti-catabolism
The training session itself is a considerably pro-catabolic stimulus. In order to blunt that catabolism and prevent unnecessary muscle loss during and right after training, a post-workout bolus of carbohydrate and protein has been shown effective, more effective than protein alone.

- Glycogen Repletion
Not only does glycogen provide the main source of energy for intense and voluminous weight training, it has other beneficial effects as well. If glycogen is not repleted post-training, chronically low glycogen stores may result. Such low levels will make the hardest forms of training almost impossible, and these are the ones that grow the most muscle (and save the most on a fat loss phase). If maximum muscle is the goal, loaded glycogen is a must. In addition to providing energy for the necessary hard training of body composition enhancement, glycogen levels are themselves directly linked to muscle growth. That is, low intramuscular glycogen levels are detected, and the lower levels tend to activate AMPk, which is a regulator of cell metabolism and muscle growth that tends to encourage endurance-type adaptations and muscle LOSS. Thus, chronically low levels of glycogen can actually blunt muscle growth simply by being low, even if training intensity is somehow unaffected.

The hormonal and intracellular regulatory environments of the post workout window (especially after very hard workouts) enhance the sensitivity of muscle (that which has just been trained) to the effects of insulin, glucose uptake, and glycogen synthesis. Through this synergistic effect, carbs consumed after training are much more likely to be incorporated as glycogen in the just-trained muscles than at rest, and thus also less likely to go to other stores (such as fat tissue, for example). Because glycogen is stored largely unaffected for days after it has been loaded, most of the glycogen used for the NEXT training session is actually loaded after THIS training session. Because the muscles trained are so sensitive to loading glycogen after training, a higher amount of carbs should likely be consumed here than at most any other time. Some evidence has shown that protein (particularly whey) co-consumed with post-workout carbohydrate can actually enhance the glycogen-synthetic effect, so should also be a consideration for consumption.

- Anabolic Activation
Not only does ingested protein help with glycogen loading, but the combination of protein and carbs (especially high-GI carbs and whey protein) consumed post-workout has the effect of spiking (raising) insulin levels. High insulin levels post-workout are not only anti-catabolic, but affect the muscle glucose uptake, muscle glycogen synthesis, and anabolic machinery of the muscle just trained. Insulin is an independent anabolic agent for muscle, and actually stimulates muscle growth upon binding to the muscle cell surface. If carbs and protein are consumed post-workout, such acute growth effects are maximized. There is also some evidence to suggest that the mTOR (a central regulator molecule of muscle growth) and later transcriptional and translational changes initiated by insulin (and interestingly, the leucine found in whey protein through another independent pathway) have the effect of altering

longer-term growth rates. That is, exposure to high insulin levels post-workout may result in higher rates of muscle growth for the next several days (as compared to no such insulin exposure), which has been shown to sum to a significant amount of muscle in some of the literature on the subject.

For various workout types, the recommended post-workout ratio of carbs to protein is similar than for the intra-workout meal, but this time a full meal-size of protein is used, as the next meal won't be for several hours and the demand and ability to absorb carbohydrates is now considerably higher than it was during training itself. Recommendations:

Post-training Carb:Protein Ratios

Light Workouts	2:1*
Moderate Workouts	3:1*
Hard Workouts	4:1*

* ratio of carbs to protein in the post-training meal

Because the recently-trained muscles lose insulin sensitivity (and thus their proclivity to synthesize glycogen, activate anabolism, and uptake amino acids for both anabolism and anti-catabolism) as time passes, it's likely optimal to consume the post-workout meal/shake as soon after activity as realistically possible. Having consumed the recommended pre- and during- nutrition can allow a small window of perhaps as long as 30-60 minutes before this needs to be done. Because timing is of the essence, high levels of fat, fiber, and slow-digesting carbs and proteins should be avoided. A fast-digesting protein like whey and a high-GI carb is a good starting recommendation.

d.) Post-post training

Training, especially hard training, has been shown to keep glucose uptake of the trained muscles meaningfully enhanced for up to 6 hours after the training process. Thus, in order to further maximize the benefits (listed above) of the post-workout meal, the next meal (2-4 hours later) should follow similar guidelines. Because the muscle cell is no longer as sensitive to glucose uptake, the protein-paired recommendation of carbohydrate consumption is not as high:

Second Meal Post-training Carb:Protein Ratios

Light Workouts	2:1*
Moderate Workouts	3:1*
Hard Workouts	4:1*

* ratio of carbs to protein in the second post-training meal

e.) Other times, off days

Taking a look at the numbers of carbs that are recommended for consumption in the workout window (pre, during, post, post-post), we're not left with much carbohydrate to consume for the other meals of the training day. That is, once we've properly addressed our workout window needs, most of our daily carbs have already been consumed, and consuming many more carbs than that can take us way over our recommended daily carb amounts, thus violating the principle of macronutrient amounts.

From the examination of optimal carb consumption on non-training days (from the macronutrients discussion earlier), we derived the figure of less than 0.5g of carbohydrate per pound bodyweight per

day. In a 200lb bodybuilder, this would mean less than 100g per day on non-training days, which is considerably lower than on training days, especially the harder ones. There are 4 distinct reasons for the recommendation of lower carbohydrate intake during non-training days:

1.) Glucose uptake and glycogen synthesis is vastly more active in the muscles trained during and several hours after training when compared with a rest day (or time on a training day far outside the workout window). Any consumed carbohydrates enter into one of 3 general pathways; glycogen repletion in liver/muscle, anabolism into adipose tissue in fat cell, and use by varied tissues for the provision of immediate energy. Carbs taken in during the uptake-sensitive workout window will be more likely to enter into the first pathway (glycogen synthesis in liver and muscle), and by definition less likely to enter into current energy use and *especially important* for our purposes, fat tissue. Eating carbs around workout windows both enhances the glycogen loading process (which is anabolic to muscle for the reasons discussed in the post-workout carbs section) AND reduces the proclivity of fat building.

2.) When glycogen is loaded into a muscle, it tends to remain loaded in the muscle for days afterwards. Unless the person has a very physical job (in which case they probably need more carbs anyway), a minimal amount of carb intake can keep the muscles loaded with glycogen until their next workout so long as they were mostly loaded during the post-workout period the last time they were trained. Thus, the second reason that carbs should remain much lower on non-training times and days is that they are simply not needed for the very important process of elevating and maintaining muscle glycogen stores.

3.) When muscles are trained, especially with heavy weights and high volumes, they take on a considerable amount of damage. A majority of this damage is likely caused by the inflammatory process that also causes DOMS (delayed onset muscle soreness). While this muscle damage is likely an important contributor towards the process of muscle growth, it has a perverse effect on insulin sensitivity and glucose uptake. Trained (and thus damaged) muscles that are experiencing DOMS have been repeatedly shown to demonstrate a very profound resistance to carbohydrate uptake. This effect is not evident immediately after training, but becomes significant several hours after and tends to peak concurrently with DOMS, usually the next day. That is, if carbs are consumed during the time that trained muscles are sore, only a small percentage of those carbohydrates will be taken up and synthesized into glycogen. Thus, most of the carbs that will replete muscle glycogen should be taken in within the several hours after training, in part because waiting until the next day (when the muscles are sore) will be a poor strategy from the standpoint of muscle glycogen resynthesis. If muscle glycogen is not optimally repleted given the circumstances, this will affect training negatively. Additionally, this will also make fat gain more likely, as any given amount of carb consumed when muscles are sore is now more likely to be converted to adipose tissue when compared to the resting, non-damaged muscle, and even more so when compared to the post-workout glucose-sensitive muscle.

4.) The last reason for reducing carb intake significantly during non-training times and days is the least impactful and most tentative. If excess carbs are consumed, especially outside of times of higher insulin sensitivity (such as during- and post-workout windows), they tend to cause chronically elevated blood glucose levels. In healthy individuals who train often, this is almost certainly not a concern, but in those individuals with higher body fat levels especially, such feeding patterns may contribute somewhat to chronically lowered insulin sensitivity, especially in muscle tissue. Such a lowering of insulin sensitivity means not only that the anabolic processes of glucose uptake and glycogen repletion are interfered with, but also that insulin's direct anabolic signaling to the muscle is now downregulated, which means a further sacrificing of optimal muscle growth and retention potential. And since lowered muscle insulin sensitivity leads to higher blood glucose levels, the extra glucose is somewhat more likely to be taken up

and stored as fat tissue, further inhibiting optimal body composition. These effects can take a long time to develop (months), but may become meaningful in the long term and interfere with an individual's maximal potential to carry as much muscle and as little fat as they can.

Given the state of the evidence it seems that having carbs on the lower side may be a good idea on non-training times and days. On the other hand, there are at least a couple of reasons to keep in *some* carb intake on those times and days. The most profound reason is that carbs are the overwhelmingly preferred fuel for the nervous system, and that most people use their brains at work! When going completely no-carb on non-training times and days, a side effect may be reduced work performance, distracting cravings for cheat foods high in carbs, and a generally poorer mood state (biggest understatement of this book). Additionally, people who work physical jobs need carbs not only to fuel their activity, but also to replete the glycogen they are using at work so that their muscles are loaded when the next training session comes up. In any case, even with the limitations on carb intake on non-training times and days, carb intake should still be considerably lower on these times, with the upper end likely being 0.5g per lb bodyweight (for highly active people) and going as low as "close to zero" grams of carbs (only trace carbs from meats, nuts, and greens) for less active people or those cutting calories.

Fiber Timing

Fiber, a non-digestible carbohydrate source, is a nutrient which has been shown to enhance overall health, especially GI tract health. Fiber is usually consumed in the diet via fruits and vegetables, and is prevalent in whole grains as well. From a timing perspective, fiber intake can remain unaltered throughout the day, but some special circumstances do apply during the workout window. Fiber is difficult to digest, slows down the digestion and absorption of any other foods it is eaten with, and also lowers the glycemic index of any carbohydrate it is consumed with. For those reasons, it should largely be kept out of the intra- and post-workout meals, as ease of digestion (to prevent discomfort during training), speed of digestion, and maximization of the glycemic index (to be discussed in detail in Chapter 5) are all important to the intra and post-workout environments.

Fat Timing

Having just labored through the intricacies of carbohydrate timing, it may be pleasant to realize that the timing of fat intake is much simpler.

Fat has very similar effects to fiber on the digestion of co-ingested carbs and proteins. It is difficult to digest, slows digestion down even more profoundly than fiber, and can drastically lower the glycemic index of consumed carbohydrates. Thus fat needs to be limited in amount for the pre-workout meal (more fat can be consumed if the meal is far away from the workout, less fat the closer the meal is to the workout). Fat should be almost absent in the intra-workout shake, as it confers no hypothetical advantages and only produces problems. Lastly, fats should be limited in the post-workout meal, as timing is still important here. In other meals of the day, higher amounts of fat consumption can be appropriate to fill in calorie needs after protein and carbohydrate needs have been met.

The only other concern with fat timing is actually not so much a constraint as it is an advantage. Because fat has the ability to delay the absorption of co-ingested carbs and proteins as well as to slow down their rates of digestion, it can be utilized effectively to time meals over long intervals. For example, if eating is not possible for some scheduling reason for the next 6 hours, a large amount of fat can be consumed in

the meal before that interval, along with the usual protein and carbs. This will allow for the maintenance of consistent blood amino acid and glucose levels for much of that time, as opposed to consuming the usual amount of fat one does every 4 hours and risking possible muscle loss and poor energy levels towards the end of that longer meal interval. A very good application of this strategy is to consume a considerable amount of healthy fat with a night-time casein shake. Because both nutrients are very slow-digesting, such a mix can allow for the maintenance of blood amino acid levels in excess of 8 hours, meaning that sleep does not have to present a catabolic scenario.

Main Points and Real World Tips
- Nutrient timing has a much smaller effect on body composition than calories or macros - Any number of meals works well, but best results are likely in the 4-7 meal range per day - As long as protein is eaten in all meals, post-workout protein timing may not matter - Eating most daily carbs pre, during, and post workout seems to have a small advantage - Fats and fiber should be largely avoided close to or during the workout

Sources and Further Reading:

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http://www.ncbi.nlm.nih.gov/pubmed/15806828

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3.) DOMS reduces muscular glucose uptake:

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http://www.ncbi.nlm.nih.gov/pubmed/8913325

4.) Intra-Workout Carbs:

http://www.ncbi.nlm.nih.gov/pubmed/23846824

5.) General guidelines of intake for strength/power and body composition athletes:

http://www.ncbi.nlm.nih.gov/pubmed/21660839

6.) Recommendations for Natural Bodybuilding Diet Preparation:

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Chapter 5: Food Composition

Food Composition is fourth on our list of highest nutritional priorities, as displayed in Figure 4 below. As you can tell from the figure, food composition is a *detail* of dieting for body composition and should not be mistaken for a main feature.

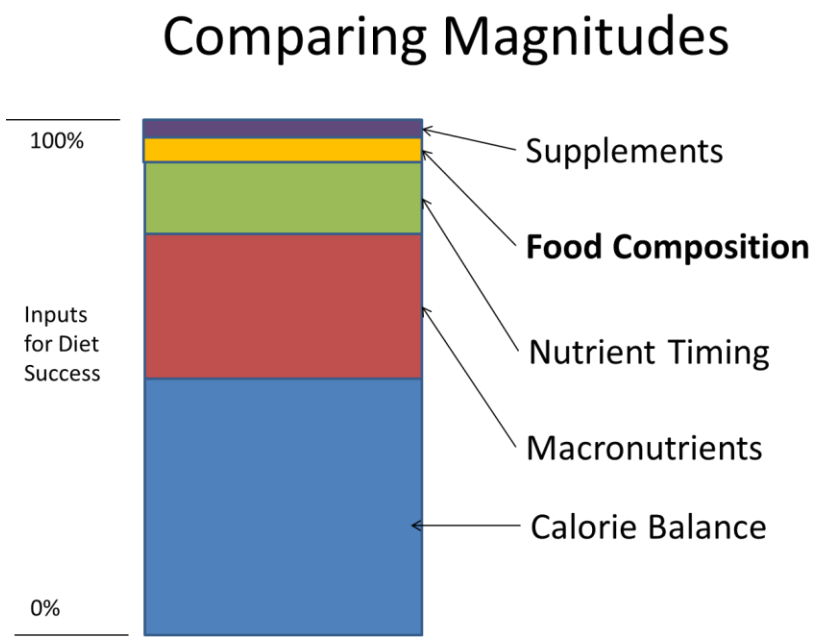

Figure 4: Food Composition and the Diet Priorities

Protein Composition

Protein composition/quality, which can be measured by several variables, most often as bioavailability, is an indicator of what percent of the protein ingested is actually absorbed into the bloodstream. Additionally, protein quality also considers the proportion of the protein that is composed of essential amino acids (those your body cannot make itself) vs. non-essential amino acids (those it can). In general, protein quality ranks from animal sources to plant sources. Here is a non-comprehensive list of protein quality, with the most high-quality sources first:

Whey Protein Isolate
Whey Protein Concentrate
Egg Sources (cooked, not raw)
Meats (beef, pork)
Poultry (chicken, turkey)
Fish and Seafood
Soy Protein and Quinoa
Strategically Combined Plant Sources (beans and rice)
Isolated Plant Sources (whole grain bread by itself, nuts by themselves)

Generally, better improvements in body composition will be expected if the proteins higher on the list predominate in the diet over the proteins lower on the list. It must of course be made clear that such differences are *very minor*, accounting for at most perhaps several percent of the variance of diet success. This means that much to the chagrin of proud meat-eating weight trainers the world over, vegetarian athletes can reach exceptional achievements in body composition alteration. On the other side of the coin, however, is the realization that trying to compete all-out in physique sport (bodybuilding, for example) likely means that consuming meat products is highly recommended.

Carbohydrate Composition

Carbohydrate composition can refer to two concepts. One is the micronutrient and fiber quantity of the carbohydrate, which we will discuss in the chapter on micronutrients and water. The other, which we will discuss here, is the glycemic index of the carbohydrates consumed.

The glycemic index of a food is technically a measure of both how fast that food raises blood glucose levels, and how much it elevates insulin levels. Because proteins and fats have a much smaller (sometimes zero) ability to alter insulin or glucose levels, the glycemic index only applies meaningfully to carbohydrates. Ranked from 0 to 100, all carbohydrate sources appear somewhere on the glycemic index. Faster absorbing and more insulinergic carbs appear closer to 100, and slower absorbing (and digesting) carbs appear closer to zero. Because fiber and fat slow digestion and absorption, they have a lowering effect on the glycemic index of any co-ingested carbs. Here is a non-comprehensive list of carbs and their GI ratings:

Dextrose Powder 100
Cornflakes 90
Baked Potato 85
Gatorade 80
Wonder Bread 75
White Bagel 70
Bananas 65
Honey 60
Whole Grain Bread 55
Brown Rice 50
Peaches 45
Whole Grain Spaghetti 40
Carrots 35
Skim Milk 30
Grapefruit 25
Peanuts 5

Generally speaking, Nuts and legumes have the lowest GIs, fruits and milk products are a bit higher, whole grains are in the middle range, processed carbs are on the high end, and sugary cereals and Gatorade top the list.

Although the glycemic index of carbohydrates is by no means a prominent variable in the alteration of body composition, it may play a role in the timing of carb consumption.

It has been shown that even equated for carbohydrate amount, high glycemic index carbohydrates replenish glycogen more rapidly and completely. There is still other data to suggest that if a diet consists primarily of high GI carbs vs. low GI carbs for all meals and over multiple weeks (think fruit loops for every meal), higher bodyfat levels and lower levels of muscularity result. Because these findings also fall in line with theoretical predictions quite well, some tentative recommendations can be drawn.

Because high glycemic carbohydrates replete glycogen more effectively, and also because they cause a more profound insulin spike (and are digested rapidly to be available in the blood right after training), they should likely be consumed during and right after training. However, in the meals following training, each carb meal that is further away from training should probably be of lower and lower GI, so that the risk of higher fat levels and lower muscularity of chronically high GI consumption is mitigated. Thus, Gatorade during training, sugary cereal right after training, and then brown rice in the next meal may be a sound example.

The pre-workout meal's GI should be arranged so as carbs are mostly digested and in the blood by the time training starts. Thus, if the meal is consumed 3-4 hours before training, it should probably contain lower GI carbs, but if it is consumed an hour or so before training, higher GI carbs are likely more optimal. For carbs consumed outside of the workout window, lower GI varieties are highly preferred.

Fat Composition

Fat composition is a very minor variable in the grand scheme of body composition alteration. However, chronically consuming certain kinds of fats and staying away from others will probably make a small but meaningful difference in body composition.

Fats can be split into two basic categories: Saturated and Unsaturated. It can further be broken down from there (see chart below):

Fat Composition Recommendations

Fat Type	Recommended Intake	Example Foods
Monounsaturated	60%	Avocado, nuts and their butters, olive oil
Polyunsaturated	15%	Vegetable oils
Healthy Saturated	15%	Coconut/macadamia nut oils, grass fed animal fats
Conventional Saturated	10%	Fats from conventionally farmed bacon, eggs, cheeses, butters
Trans	0%	Store-bought baked goods, most fast food

The above chart illustrates the primary categories of fats and their most common dietary sources. As you can see, for both body composition and health enhancement, most fats consumed should be unsaturated, and the predominance of those should be monounsaturated. For the saturated fats that are consumed (most will be from unintentional consumption via meats), its likely best to stick with the healthier varieties, which may also support more lean tissue and less body fat. Fats that occur in cheeses, eggs, butters, etc are probably safe and supportive of body composition when consumed in small amounts, as shown above. However, trans fats, which are added to some types of highly processed foods and foods needing a very long shelf-life, should be avoided for the most part as they have been shown to be considerably deleterious to health and also have negative effects of muscle growth and supportive effects on fat gain.

Main Points and Real World Tips
- Food composition plays a very small role in body composition results - Vegetarian options are fine, but best results are possible with animal protein comsumption - High GI carbs are best around the workout window, lower GI carbs at other times - Most fats consumed should be monounsaturated, saturated fats are ok in smaller amounts - Trans fats should be avoided as much as possible

Sources and Further Reading:

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2.) Glycemic Index and Body Composition/Health:

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4.) Fat Types and Health/ Body Composition:

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5.) General recommendations for Food Composition:

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Chapter 6: Supplements

The final ingredient in a diet designed for optimizing body composition is the inclusion of supplements. As you can see from the priority graph in Figure 5, supplements are likely the least effective dietary intervention of all so far mentioned.

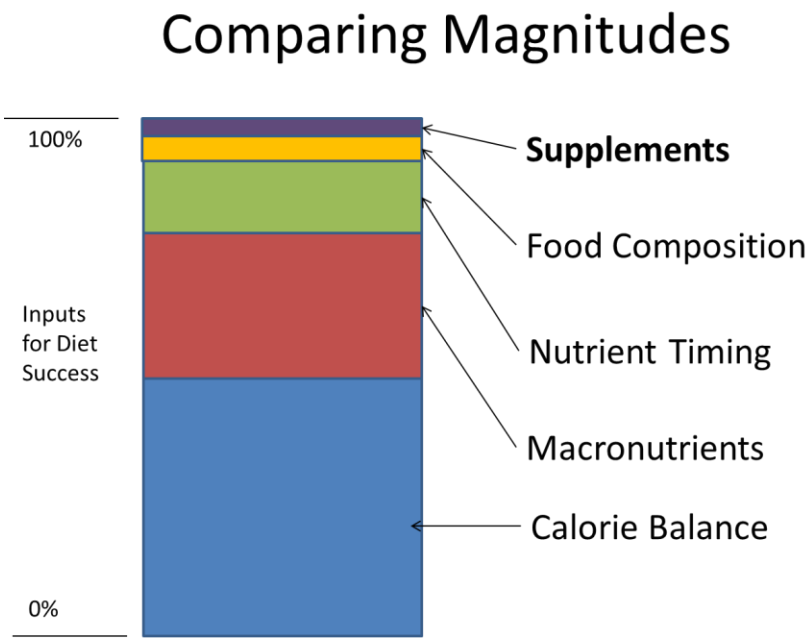

Figure 5: Supplements and the Diet Priorities

Some supplements are effective, but food composition, nutrient timing, and certainly macronutrient amounts and calories are much more powerful in their effect on body composition.

The other big issue with supplements is difficult to put forward without sounding offensive, but it must be clearly stated: the *vast majority* of supplements (of the ones sold on the market as a whole, both via supplement stores and the internet) probably have no measurable effect on body composition. In fact, only several supplements meet the two basic criteria for inclusion as "effective" in our discussion. The criteria are research volume and research consensus. Some supplements have fewer than 5 or 10 studies exploring their effects, and we simply can't recommend supplements with that little research behind them, even if they are promising. The research volume (number of total studies conducted) should be as high as possible, but definitely higher than 5 or 10 studies. Once a supplement has a high amount of data behind it, we then look at the research consensus of that data. An overwhelming majority of studies on creatine, for example, show a positive effect on body composition and the variables (training volume, for example) that support body composition. Thus, creatine makes our list. On the other hand, even a supplement with a high volume of research may not make the list because it simply does not have a clear research consensus. Glutamine is one such supplement. Glutamine has been very extensively researched, but unfortunately the best literature reviews cannot conclude any meaningful effect of glutamine on body composition. Thus, glutamine does not make our list of effective

supplements. As a matter of fact, only 5 classes of supplements make our list.

Whey Protein

When milk is dehydrated and the protein fraction is isolated, it is composed of two parts: whey and casein. The whey fraction of milk protein has a particular set of features which make it an almost ideal supplement for intra- and post-workout consumption:

- Fast Digestion and Absorption Speeds
Whey protein is one of the fasted digesting and absorbing protein sources, as it breaks down into amino acid strings that are passed into the intestine even faster than most individual amino acids. This digestion also takes a relatively small input of gastric enzymes, which makes whey a great choice for intra-workout amino acids, since it is very unlikely to cause GI distress during high workloads. Its speed of absorption also makes it a great candidate for the intra-workout role and especially the post-workout role, since it is available for stimulating anabolism and reducing catabolism with very little delay. This is not a massive advantage, but it likely counts in the long term with regular supplementation.

- Excellent Protein Quality
On many indexes of protein quality, whey scores even higher than the "100%" standard of egg whites. In fact, whey tops almost all formal lists of protein quality. Whey is also high in leucine and the other BCAAs (branch chained amino acids), which may offer a slight anabolic and anti-catabolic advantage.

- Side Effects and Price
Whey protein is well tolerated by almost all individuals (almost all modern formulas have lactose removed), has no reliable side effects, and is one of the cheapest supplements (per recommended dose). In general, whey is almost ideal for intra- and post-workout consumption.

Glycemic Carbohydrate Supplements

Much like whey protein, glycemic carb supplements (such as Gatorade, PowerAde, and some advanced carb powders) offer a particular small yet meaningful advantage for the workout window. Much like whey, these supplements are very easy to digest, cause very little GI distress for how much carbohydrate they deliver, and have a rapid digestion and absorption rate. Additionally, they are highly glycemic and insulinergic, which means they get into the blood rapidly and also cause a large insulin response, which is almost ideal for the intra and especially post-workout environment.

Also priced very well for their carb amounts (especially powdered Gatorade and PowerAde, which are often available at Walmart, Costco and Sam's Club), glycemic carb supplements are a good choice for intra- and post- workout carbohydrate intakes.

When purchasing these supplements, we would recommend Gatorade and PowerAde powders. They are both glycemic AND enter circulation very quickly. Some of the more advanced carb supplements,

such as Waximaize starch, were initially touted as rapidly absorbing, but turned out to be very low on the glycemic index (interestingly enough making them good candidates for a carbohydrate source in a meal replacement shake). Some more recent carb powders seem to be even higher GI and faster absorbing than Gatorade and PowerAde, but research on these is limited, which limits our ability to recommend them at this time.

An important point to note is that if the percent of solute in a workout shake far exceeds 8%, then the speed of nutrient delivery from that shake into the bloodstream will slow, as water will actually be sucked into the GI tract to dilute the contents instead of flowing out into circulation. This dehydrating effect can slow post-workout delivery AND actually decrease workout performance if the over-concentrated shake is consumed during the workout. Thus, for every 80g of carbs and protein in your shake, it is recommended that 1 liter of water be used.

Creatine

Creatine has been an industry standard supplement for over 20 years. It has been shown to reliably offer the following advantages:

- Enhanced ability to do reps in any one set
- Enhanced recovery ability between sets
- Hypertrophic stimulus independent of training
- Intramuscular water retention, which makes the muscles look bigger as long as you're taking creatine,

With over 20 years of research, no reliably repeatable side effects of creatine have been reported. That is, some studies have found that creatine can cause stomach upset, bloating and cramps in some users, but those findings are absent from enough studies for there to be considerable doubt as to whether these are in fact creatine-caused. And please take what some misled healthcare providers and coaches have claimed with a big grain of salt; if you have healthy kidneys and have been cleared for exercise and regular diet by your doctor, creatine is almost certainly safe.

The most commonly studied version of creatine is Creatine Monohydrate. Other forms of creatine have been researched, but the results are inconclusive to date, so creatine monohydrate is the recommended version. The good news is that it is very well tolerated and incredibly cheap. 5-10g per day (regardless of timing) is an appropriate dose for individuals of all sizes (with larger individuals trending towards 10g and smaller individuals closer to 5g).

Creatine works by being stored in the muscle when consumed in excess of its degradation (which 5-10g does). It’s possible to speed up the saturation of muscle with creatine if creatine consumption is 4x the usual in the first 5 days of supplementation, likely split over 4 even 5-10g doses per day. Once this "loading" period is over, regular consumption (5-10g per day in one dose) can resume.

There may be some negative feedback effects of creatine consumption, so it might be a good idea to

take creatine for 2 months on and 1 month off of supplementation.

Stimulants

Stimulants, of which the most popular, safest, and most effective is caffeine, are well-researched and offer a small but considerable advantage to individuals seeking to optimize their body composition. Stimulant use has been shown to have the following five benefits in this regard:

- Increased Motivation for Training
Stimulant consumption has been shown to slightly enhance training motivation in the majority of individuals. This can be a big help during the end of high-volume training cycles where cumulative fatigue is high and motivation can waver. Taking caffeine 30 minutes before training can be a slight but meaningful boost to training results.

- Enhanced Ability to Maintain Performance During High-Volume Training Sessions
Stimulants have been shown to be especially effective in maintaining maximal performance at the tail-end of longer duration (1 hour plus) exercise sessions. Thus, stimulants can offer a slight benefit for those engaging in longer session of high-volume training, sport practice, or cardio.

- Enhanced Pain Tolerance during Training
Training hurts, and the hard weight and cardio training required for body composition optimization hurts a lot! Stimulants can blunt pain sensation during hard training, which is a part of the reason they also allow for higher outputs at the tail end of longer sessions. In order to push it, especially towards the end of a program (just before deloading), stimulants are likely to help supply an advantage.

- A Slight Fat-Burning Effect
Although not a major factor, stimulants do raise the metabolic rate by a small amount, and can help burn just a bit more fat and help with slightly more weight loss than otherwise.

-Appetite Reduction
Perhaps one of the most profound advantages of stimulants is their ability to reduce appetite in most users. This can be of great assistance during a cutting diet, especially at the tail end, when hunger can be distracting and downright annoying.

Recommendations for Stimulant Use

- Stick with mostly caffeine-based products, as they are the most well-researched
- Use ONLY the recommended doses of any pre-workout stimulant products. Otherwise it's easy to get carried away to an unsafe consumption level
- Start slowly with coffee and diet soda consumption, and work up over the course of several weeks to higher intakes
- Don't consume stimulants too close to bedtime, as they often interfere with sleep
- After a cutting phase don't come off of stimulants cold-turkey, as that can cause very profound hunger levels over the short term, and may sabotage your ability to maintain the fat loss. Once the cutting phase is over, slowly taper back on the stimulant consumption over the course of several weeks
- Always, always make sure you're cleared to consume stimulants by your physician

Casein

The second half of the milk protein fraction, casein, is also a high quality protein. Unlike whey, casein is the polar opposite in digestion and absorption speed, with some studies demonstrating up to 7 hours of continual, slow amino acid release into the blood from a single dose of casein protein. This makes casein the ideal supplement for bedtime consumption, or consumption during long meal-to-meal intervals when eating whole foods is not an option. It's safe, and although it's more expensive than whey, it's quite cheap if used only when needed.

Other supplements may be effective, but have as of yet to show the research volume and consensus of the above-listed products. Fish oils and multivitamins are probably good to take in as an insurance policy, but a well-balanced and effective diet makes them a bit superfluous much of the time.

Main Points and Real World Tips
- Whey protein makes an excellent choice for intra and post workout meals - Glycemic carbs during and after workouts can help improve outcomes - Creatine is a time-tested, safe, and effective supplement for muscle gains and health - Stimulants like caffeine have many benefits, but must be used moderately and wisely - Casein protein is a good choice before long periods without eating, such as overnight

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Chapter 7: Micronutrients and Water

Water

Water is essential for proper body functioning, but is commonly overlooked when considering proper nutrient intakes. Even mild dehydration, loss of 2-4% body weight, can have a significantly negative impact on athletic performance. Some dehydration during activity is inevitable, given the fact that during high intensity activity an individual could sweat out up to two quarts of water per hour, but the gastrointestinal tract can only absorb one quart of water per hour. Proper hydration before, during and after activity is important to having the best possible workouts and thus to gaining the most muscle and losing the most fat.

In terms of daily consumption, the recommended intake is 5 ounces of fluid for every 100 calories consumed. If your diet consists of 4000 calories then you would need to consume 200 fluid ounces each day. To ensure proper hydration levels going into activity, one should consume 17-20 fluid ounces two to three hours prior to activity. Another 7-10 fluid ounces should be consumed ten to twenty minutes prior to activity. During activity, if possible, it is recommended that seven ounces be consumed every fifteen to twenty minutes.

Post exercise, there are two simple methods that can be utilized to determine the amount of fluid that needs to be consumed. One method is to observe urine color. The other method is measuring your body weight before and after activity. Ideally, urine should be very light yellow or clear. If your urine is darker than that, you need to rehydrate until your color returns to appearing light yellow or clear. The recommended rate of fluid consumption during rehydration is 7-10 fluid ounces every ten to twenty minutes until rehydration criteria have been met. When using weight loss as a measure of dehydration, the difference in body weight is how much fluid was lost during exercise. The amount of fluid lost during activity needs to be replaced by a 150%. Meaning, if one pound is lost, that is 16 ounces, 24 fluid ounces need to be consumed at the proper rehydration rate of 7-10 ounces every ten to twenty minutes.

To summarize the recommendation on water in a very non-technical way: drink fluids regularly, drink during training, and maintain a clear or off-yellow urine color at most times. This will encourage better performance and recovery from training, in addition to keeping organs healthy and properly functioning.

Vitamins

There are two classes of vitamins: water soluble and fat soluble. This classification is based upon how the vitamin is absorbed out of the digestive tract and into the body. Water soluble vitamins are easily absorbed as they are bound to water molecules and freely move from the digestive tract into the blood stream. Fat soluble vitamins are absorbed alongside dietary fat. Meaning, dietary fat must be present in the small intestine at the same time as the fat soluble vitamin in order for the fat soluble vitamin to be absorbed. Diets that are chronically too low in fat may result in a fat soluble vitamin deficiency due to lack of absorption, rather than lack of consumption.

Once a vitamin has entered the blood stream it will need to be converted to its active form. Once activated, it most often acts as a regulator for numerous body processes. This means that the active vitamin will either facilitate or inhibit a response within the body. Vitamins are able to do this in a

number of ways. Some vitamins act as intermediate steps in long series of chemical reactions. Others are coenzymes that must bind to an existing enzyme to activate it and allow a reaction to occur. The functions of vitamins are vast and can vary from assisting with vision, to energy metabolism to bone formation.

To allow these reactions to occur you must take in adequate amounts of each vitamin. The water soluble vitamins C and B complex are found in most fruits, vegetable and some grains. The exception being vitamin B12, which is found in animal based food products such as seafood, meat, dairy and eggs. The fat soluble vitamins, vitamins A, D, E and K, are found in fat based food products like vegetable oils, salad dressing, creams and dairy. Vitamins D and K are actually also produced by the body. As the sun's UV rays interact with the cholesterol in skin, vitamin D is produced. The beneficial bacteria of the colon are able to produce vitamin K.

Vitamin deficiencies are rare when consuming a balanced diet, although they still can occur. To decrease the likelihood of developing a vitamin deficiency, you need to consume a diet that contains 6-8 servings of fruits and vegetable per day. As well as adequate amounts of grains, proteins, dairy and healthy fats. Be sure to vary your selection of food you consume as the vitamin level varies which each fruit, vegetable and grain. This means choosing a variety of greens, carbs, and meats, not just "broccoli, brown rice, and chicken" every day. Dietary fat is needed to facilitate the delivery and absorption of fat soluble vitamins. Many of the fortified cereals contain adequate amounts of both fat and water soluble vitamins. If there is concern regarding vitamin intake when on a restrictive diet, a once-a-day multivitamin can be consumed to function as a partial insurance policy (though not sustainable indefinitely).

Minerals

When thinking about training for body composition and minerals, a subgroup of minerals called electrolytes are probably the most important. Electrolytes are simply minerals that carry a positive or negative charge when in the body. This charge impacts cell function by altering the charge across cell membranes, which in turn impacts the functioning of many types of cells. Electrolytes allow for nerve impulses to travel throughout the body. They are responsible for muscle contractions in cardiac, smooth and skeletal muscle tissue. Electrolytes balance the flow of water in and out of a cell and help to maintain a neutral charge in blood fluids by balancing the acid and base levels. Many processes would never occur without the change in membrane charges brought on by electrolytes moving in and out of the cell.

Fluid balance is especially important to maintain electrolyte levels during activity, especially when sweat rates are higher. It is important to replace electrolytes along with water during activity, particularly if the activity is of high intensity, prolonged duration or occurring in a hot and humid environment. Also, during activity your body's pH level can slightly decrease as lactic acid is produced. The acid-base balancing properties of electrolytes can help the body return to a homeostatic state once activity has ceased.

The main electrolytes are: sodium, potassium, chloride, calcium and magnesium. Adequate consumption of sodium and chloride is easily meet by most Americans as these two minerals are what make up table salt or sodium-chloride. Magnesium is well consumed by individuals as it is found in a variety of food products ranging from spinach and beans to shellfish and milk.

Adequate consumption of calcium and potassium can be problematic for some individuals. The primary dietary source of calcium is dairy based products like milk, yogurt and cheese. Almond and soy milks also contain calcium, as do dark green leafy vegetables. Potassium can be found in most fruits and vegetables, with white potatoes and bananas having the highest amounts. Supplementation with a multimineral/multivitamin is acceptable if dietary consumption of electrolytes is low. The dietary supplements of single minerals, such as calcium or potassium may be available as well, but are very rarely needed for athletes following the diet priorities.

One other mineral to focus on, in terms of adequate consumption is iron. Many individuals, particularly females of a childbearing age, often do not consume adequate amounts of iron. For athletes this can be problematic because iron is a primary component of hemoglobin, the oxygen carrying component of blood. Inadequate iron intake could result in iron-deficiency anemia, which is a decrease in healthy red blood cells. This means a decrease in your blood's ability to carry oxygen to working tissue. Muscles need oxygen to continue producing energy for muscle contractions during activity. Anemia can greatly hinder high volume weight training and cardio, as well as recovery from both.

Dietary sources of iron are divided into two categories, heme and non-heme iron. Heme iron is absorbed at a greater rate out of the digestive tract (and into the blood) than non-heme iron. This means that more of the iron consumed in your diet will actually enter into circulation in the body and be utilized. Heme iron comes from the consumption of meat, fish and poultry. Non-heme iron can be found in plant sources, such as whole wheat and dark green vegetables. A dietary supplement of iron may be needed if your diet is lacking or restrictive in animal based foods.

Main Points and Real World Tips
- A well balanced diet includes a variety of meats, grains, fruits, veggies, and nuts/oils - A well balanced diet provides almost all people with adequate micronutrients - Supplementation may be of benefit to certain people in certain specific situations - Hydration is important to performance and can be well monitored by urine color and volume

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Chapter 8: Nutritional Periodization

While the direct research supporting the ideas so far presented is plentiful, the ideas discussed in this chapter are more tentative. They are based largely on the fusion of basic research with the experience of the authors (with ourselves and our many clients) and that of other coaches, as well as some direct research on the matter, which is admittedly sparse. When reading this section, it may be helpful to try to take away the most basic concepts and not so much the particulars, as the basics are very likely true, but the particulars may turn out to be slightly different in reality when research on this topic catches up to practical experience and inference.

Theoretical Underpinnings of Nutritional Periodization

The basic features of human biology and the goals of body composition alteration set up the basic guidelines of nutritional periodization. These features, or realities, are as follows:

1.) People tend to want to gain muscle and lose fat over time.
2.) The conditions that best promote muscle gain and fat loss are so different; attempting them simultaneously is highly inefficient.
3.) Muscle is easier to maintain than it is to gain.
4.) Fat is easier to lose than muscle is to gain.
5.) Attempting to gain muscle continuously for too long results in an exponentially higher fat gain.
6.) Attempting to lose fat continuously for too long results in an exponentially higher muscle loss risk.
7.) Resuming unrestricted eating after a fat loss phase or weight gain phase results in a return to the previous bodyweight if unchecked.
8.) Attempting to lose fat right after new muscle gain, without holding onto the new muscle for some time results in higher risk of muscle loss during the fat loss.

An in-depth explanation of these features:

1.) People tend to want to gain muscle and lose fat over time.

The goal of most people interested in altering body composition seems to be some combination of muscle gain and fat loss. Females may be more interested in fat loss, while males in muscle gain, but almost all are interested in at least some of each, and usually as much of each as possible. We'll focus the rest of the nutritional periodization talk on those who want both muscle gains and fat losses in the long term, as focusing on just one or the other is actually much easier and less complicated. If you know how to do both, doing just one is a piece of cake.

2.) The conditions that best promote muscle gain and fat loss are so different; attempting them simultaneously is highly inefficient.

As we have seen earlier in the book, the most powerful variable determining either fat loss or muscle gain is calorie balance. The problem is that muscle gain is favored during a positive balance (surplus) but fat loss during a negative balance (deficit). For that reason, and the myriad of biochemical downstream effects of that reason, muscle gain and fat loss are largely incompatible. It must of course be stated that

they are POSSIBLE, but very slow and less efficient than they are if separated. They are also incrementally less likely to happen together as an individual continues getting more muscular and leaner over time. There are 4 special exceptions to the high improbability of simultaneous muscle gains and fat losses. Other than in these 4 cases, muscle gain and fat loss are largely mutually exclusive:

A.) An individual who just started training.
The anabolic drive of an individual who is new to training is the best it will ever be. These individuals can gain muscle at such astounding rates, that they can even gain impressive amounts on a hypocaloric diet and lose fat at the same time.

B.) An individual who just started dieting using the correct principles for the first time.
If you're used to taking in 50g of protein per day and eating the rest of your calories over 2 meals of glycemic carbs and saturated fats, switching to a scientific diet of multiple meals per day with a total of 200g of protein and all the right timing can yield simultaneous muscle gains and fat losses for some time.

C.) An individual who just started using anabolic steroids or other powerful body composition-altering drugs such as growth hormone.
People who start on drugs for the first time and respond well to them can gain pounds of muscle while losing pounds of fat within the first months. This effect does not last indefinitely, however, and the same limitations and difficulties of simultaneous fat loss and muscle gain soon reemerge.

D.) Individuals who highly augment their current drug use.
Increasing the dose of drugs being taken by a large margin or switching to using more powerful drugs can allow for the simultaneous gain of muscle and loss of fat. This effect is however quite temporary, as greatly increasing dosages is not a process conducive to much iteration.

3.) Muscle is easier to maintain than it is to gain.

Research confirms that much less effort is required to maintain levels of strength and muscle mass than are required to gain that muscle in the first place. As a matter of fact, the initial research on this topic was quite surprising; especially as to how little one could do to maintain gains. Muscle gains are especially resistant to loss in experienced trainers, especially if they have held that level of muscularity for some time, at least on the order of months.

4.) Fat is easier to lose than muscle is to gain.

Especially in more experienced trainers, muscle gain is quite a difficult process. A gain of 5lbs of muscle per year is quite good in experienced trainers, and 10lbs per year is very impressive. Conversely, 5lbs of fat loss per year is laughable, and 10lbs can be lost in 3 months with relative ease and almost no risk to lean tissue.

5.) Attempting to gain muscle continuously for too long results in an exponentially higher fat gain.

Research on this topic is very scant, as almost no studies stretch out past several months in length and almost all are based on relative beginners who can gain more muscle than everyone else anyway. However, almost every single coach (and bodybuilder, strongman, and powerlifter) has noticed that when muscle gain is attempted for too long, even at the usual rate of 1-2lbs of tissue per week, fat gains start to creep up. As more and more weight is gained, fat becomes an increasingly greater percentage of that new weight gain, until almost all the new weight gained is fat. The consensus among coaches and athletes seems to be that continuous phases of gain that last much longer than 4 months become disproportionately risky for fat gain.

6.) Attempting to lose fat continuously for too long results in an exponentially higher muscle loss risk.

Just like number 5 above, painful experience has lead coaches and athletes to understand that diets that run for too long, even with the recommended 1-2lbs of weight loss per week, become increasingly risky to muscle as glycogen stores, fiber type alterations from high volume training and cardio, and general fatigue become more and more pronounced. Just as with the risk of fat gain from continuous muscle gain, muscle loss risk seems to greatly increase as diets approach and surpass the 4 month mark. While 12 and even 16 week diets are the bodybuilding standard, continuous hypocaloric diets of 24 weeks+ are almost unheard of.

7.) Resuming unrestricted eating after a fat loss phase or weight gain phase results in a return to the previous bodyweight if unchecked.

This feature of nutritional periodization is based around the well-established set point theory. Set point theory explains that human bodyweight has, for every individual, a certain set point. That set point is usually the amount they have weighed over the last several months. Eating a diet very hypercaloric to that bodyweight will result in an increase in metabolism. Eating a diet very hypocaloric will result in a decrease in metabolism, such that, body weight maintains relative stable unless purposeful long term dieting ensues. Interestingly, even after the conclusion of a diet individuals will tend to re-norm back to their pre-diet weight over time if they don't make a conscious effort to track their eating and activity, especially if the pre-diet weight was heavier.

8.) Attempting to lose fat right after new muscle gain, without holding onto the new muscle for some time results in higher risk of muscle loss during the fat loss.

Similarly to the bodyweight set point, there may be an independent muscle set point. Many experienced bodybuilders and coaches have reported that muscle seems to hang in better during dieting and de-training if it has been held on the body for longer, at least a month and possibly more. This is corroborated by the observation that experienced trainers tend to lose muscle more slowly than novices, and gain back faster whatever they do lose. Right after gaining a lot of new muscle (which comes with added fat due to the hypercaloric diet), it may be wise to hold the new bodyweight steady for several months before attempting to diet the fat off, as that might be a more effective way of sparing the new muscle.

Using the aforementioned 8 realities of nutritional periodization, we can begin to see the formation of a common structure to long-term dieting for enhanced body compositions.

Nutritional Periodization Applied

Taking into consideration the above 8 realities of physiology, a general outline of nutritional periodization emerges. Because muscle gain in the long term is the goal, the first phase performed is called the 'mass' phase. During this phase, a hypercaloric diet is eaten and weight is gained at the usual rate of 1-2lbs per week. Because fat gain eventually starts to outpace muscle gain, this phase is usually around 3 months in length, the average time at which the tradeoff of muscle to fat becomes suboptimal in the long term.

At the end of the mass phase, we're in the position of having acquired some new muscle gains, but with fat gains as well. Because our long-term goal is to gain more muscle but not fat, we'll have to do something about the fat stores that have accumulated. However, the fat stores will have to wait, as dieting down right after new muscle gain seems to put that new muscle at disproportionate risk of loss. Because of this reality, we must hold our diet isocaloric for several (at least one) months and allow our set points for both bodyweight and muscle to rise up to meet our current state of muscularity. This phase is generally termed the 'maintenance phase.'

Once the maintenance phase has been completed, we're in the position of having just about the same muscle and fat amounts as right after the mass phase, but our physiology is now more resistant to losing the new muscle during dieting. Thus, the 'cut' phase is next, during which hypocaloric dieting and weight loss of 1-2lbs per week predominate. Because losing muscle becomes a high risk if dieting is done for too long, this phase should last an average of about 3 months, similarly to the mass phase.

Once the cutting phase is over, the result is that we have the same physique we had before we began the last mass phase, but with several pounds (perhaps as much as 10 for relative beginners) of new muscle. Fat that was put on during the mass phase was lost during the cutting phase, and our body fat levels should be almost no different than before.

At this point, if the goal is to continue to add muscle (without adding fat) over the long term, a new mass phase is begun. This mass phase is followed by a maintenance phase, and then by a cut phase, and then the next mass phase, etc... In such a way, long-term and significant alterations of body composition are possible.

Special Circumstances

While the basic structure of nutritional periodization is a constant, some variations exist for special circumstances/goals, four of the most common of which are described here:

1.) Net Fat Loss Over Time is the Predominant Goal

If the goal over the long term is to lose much more fat than muscle gain, the approach to nutritional periodization can change somewhat. The sequence of phases remains the same, but the duration of each phase changes. For individuals trying to lose lots of fat but still gain some muscle in the medium or long term (powerlifters and bodybuilders who have gotten a bit too fat for their weight classes over several mass-maintenance-cut cycles, for example)' mass phases should become shorter while cut phases should stay the same length. For example, this would mean that a mass phase could only last one month, but after the maintenance phase would be followed by the usual 3 month cut phase. The result after all 3 phases would be a net LOSS of body fat, with only perhaps a small amount of muscle gain. Several phases repeated in this way can result in a drastic amount of fat loss over the long term, with muscle being wholly or largely conserved.

At the extreme end of this special circumstance is the desire to lose fat over the long term with no added muscle. In this case, the mass phase can be deleted entirely, and cutting phases can be separated by maintenance phases instead. In fact, such an approach (cutting phases separated by maintenance phases) is the most effective and sustainable (displaying higher adherence by most individuals) way to lose the most fat over the long term.

2.) Gaining Muscle for Sports

If gaining muscle for sports is the goal (whether it be powerlifting, weightlifting, crossfit, volleyball, or many others), the only important modifier in need of consideration is that muscle gain is optimized during periods of high volume weight training. Attempted weight gain during a peaking phase in powerlifting or in-season in volleyball will not result in maximum muscle accretion, as the sets of 3 of strength and power movements are not sufficient for maximal muscle gain. Thus, when gaining muscle for sports, the off-season is likely the best time, mostly because high volumes of weight training are possible here without interfering with the performance of the athletes in competition. This also means that seasons and tapers should be treated as maintenance phases from a nutritional periodization standpoint.

3.) Losing Fat for Sports

Very similarly to the issues with muscle gain, the conservation of muscle during a fat loss phase is best accomplished when high weight training volumes accompany the hypocaloric diet. This excludes in-season, tapering, and active rest periods of the athletic year, and relegates fat loss to the off-season portion of the sport perpetration calendar.

While there are many, many more issues, complexities, insights, and special circumstances to be considered in nutritional periodization, such discussions are probably best reserved to editorials and magazine articles at this point of the low development of the science involved.

Even what has been presented on the subject of nutritional periodization in this book is itself tentative. However, it's also, in the view of the authors and editorial staff, important enough and likely enough to be true to merit a short discussion. Especially if the underlying principles are what receive the highest consideration (vs. the particulars which are best arranged with a personal body composition coach or trainer), nutritional periodization can be of potentially great utility, especially in long term goals of enhancing body composition.

Main Points and Real World Tips
- Muscle gains are fastest with excess calories, fat losses with a calorie deficit - Muscle gain and fat loss should likely be separate phases due to the previous point - Dieting to lose fat or gain muscle for too long (4 months +) can add fat, decrease muscle - Athletes are best served to diet in the offseason (not in-season) for gains or fat loss

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Chapter 9: Designing your Diet

We've learned quite a bit about the science and reasoning behind designing a diet to enhance body composition. In this chapter, we'll go through and actually learn to design an exact diet, step by step. We'll do this of course by starting at the most important and impactful diet principles and working our way down. Thus, our first priority is to determine calorie intake.

Calorie Balance

To determine calorie intake, we're going to use the example of a 180lb individual. We will determine the approximate maintenance calories for 3 different training conditions: light workout days or off days, moderate workout days, and hard workout days.

To review, we categorize workout volumes with the following general guidelines:

Light workouts (or no training):
- Less than 5 reps per set on average
- Less than 6 working sets for compound lower body moves
- Less than 10 working sets for compound upper body moves or any isolation moves

Moderate workouts:
-Sets of 5 reps per set on average
- 6+ working sets for compound lower body moves
- 10+ working sets for compound upper body moves or any isolation

Hard Workouts:
- Sets of 10 reps per set on average
- 6+ working sets for compound lower body moves
- 10+ working sets for compound upper body moves or any isolation

After utilizing the Harris-Benedict equation and adjusting for several other factors, we have a *very rough* beginning estimate of calorie needs for the various training days in the table below:

		Training Volume	
Bodyweight	Light/Off	Moderate	Hard
100lbs	1500	1935	2400
125lbs	1650	2185	2650
150lbs	1850	2435	2900
175lbs	2050	2785	3200
200lbs	2300	3135	3500
225lbs	2550	3585	3950
250lbs	2850	4035	4400
275lbs	3150	4585	4950
300lbs	3550	5135	5500

There are several sources of estimate error in this table that must be mentioned.

- The Harris-Benedict equation was derived using subjects of average body composition. Leaner subjects at any weight have higher metabolic needs. We've corrected for this to some extent, but people even within the fitness community vary quite a bit, and these initial estimates might not be exactly correct.

- Taller people tend to have higher surface area and thus need more food to stay warm in room temperature, females have less muscle and their sex hormones set a lower metabolic rate, and age alone plays a factor. While the Harris-Benedict does take those values into account, we've averaged them out to keep things simpler for your first calorie intake estimate. Even within height, weight, and gender groups, metabolisms vary quite widely, so that ANY first-time estimate will almost always be off by some degree.

- While our chart takes training volumes into account, it does not take daily activity into account. A lawyer who trains with high volumes will need far fewer calories than a personal trainer or factory foreman who trains with the same high volumes, because the lawyer spends a much greater proportion of his day sitting at a desk while the other two careers require potentially constant and rather intense physical activity. Thus, if you have a physically active job, it's likely that you may need more calories to maintain your bodyweight than what is displayed here.

These sources of error are precisely why bodyweight tracking is such an important tool in diet customization for the individual. The above guidelines are a great *start*, but only through adjustments made by taking into account bodyweight alterations can a diet truly reflect the needs of the individual.

Now, onto our example 180lb individual. From the table above, they will start the diet with the following daily calorie goals:

Light/Off Days: 2050 calories

Moderate Training Days: 2785 calories

Hard Training Days: 3200 calories

We'll construct the rest of the diet for the weight-maintenance condition, and then learn to modify our finished product. Up next, it's time to determine macronutrient (protein, carb, fat) intakes for the diet.

Macronutrients

The first macronutrient is protein, and we'll base our amounts off of the "optimal" intake requirements mentioned in the section on protein intake in Chapter 3.

- Determining Protein Intake

Determining protein intake is quite simple, but two pertinent variables can make this determination a bit more precise. Optimal protein intakes are about 0.8g to 1.0g per pound of body mass per day. So our

180lb example individual would choose an average intake of somewhere between 145g and 180g of protein per day. The two pertinent variables to integrate into the choice within this range are percent body fat and activity level. There is good reason to assume that leaner people of the same body mass need more protein (as muscle is a higher protein-demanding tissue than fat by far), as do people who are active (burn more calories per day by either training, having fun, or working). The higher protein demands of the more active group are derived from both the likely higher FSR (fractional synthetic rate) and FBR (fractional breakdown rate) curves created with higher activity levels.

Thus, if you're leaner than 10% bodyfat or so for males and 20% or so for females and you are very active and train with high volumes frequently, an intake of 1g per pound body mass may be more suitable. On the other hand, less active people with higher body fat percentages are likely to meet all of their protein needs (even for growing muscle and preventing muscle loss during dieting) with only 0.8g of protein per pound body mass per day. Let's assume that our example 180lb individual is relatively lean and very active, so we'll assign an intake of 180g of protein per day.

- Determining Carbohydrate Intake

In the realm of body composition enhancement, we'll use the "Optimal" recommendations for carb intake starting points from Chapter 3. They are:

Non-training days: less than 0.5g per day
Light workouts: 1g per lb per day
Moderate Workouts: 1.5g per lb per day
Hard workouts: 2g per lb per day

Thus, our 180lb individual would choose different carb intakes on different days based on his workout schedule, with amounts ranging from 90g of carbs on non-training days all the way up to 360g of carbs on hard-training days. We can now see that the eventual diet result will vary in both total calories and carbs on the various days, but not protein intake.

If the individual is not pursuing body composition outcomes per se and is more focused on sport performance optimization (especially endurance or multi-sport athletes), then the carbs intakes recommended here *may not apply*, and may be higher under some conditions.

- Determining Fat Intake

Fat intake calculations are the easiest part by far. Just take the daily calories for the particular day for which calculations are being made, subtract protein and carb calories, and bam, fat calories can be calculated. Just as a reminder, protein and carbs contain about 4 calories per gram and fats about 9, so divide that fat calorie number by 9 and you'll get a daily total of fat intake in grams.

After performing all of the necessary calculations for calories, proteins, carbs and fats, we can generate a table of needed calorie and nutrient amounts, just like this one for our 180lb example athlete:

		Daily Intake 180lb Example		
Training Type	Calories	Protein	Carbs	Fats
Non-Training Day	2050	180	90	108
Light Training Day	2050	180	180	68
Moderate Training Day	2785	180	270	109
Hard Training Day	3200	180	360	115

For your own needs, simply go through the steps and refer to the tables and formulas for all calorie, protein, carb, and fat values and you'll have the beginnings of a diet! Next up, nutrient timing, where the construction of actual meals first begins!

Determining Meal Structure (Nutrient Timing)

Because the concepts of nutrient timing can get fairly intricate as we have seen in chapter 4, we can make diet design simpler if we narrow the recommendations down to a simple set of rules and formulas. Following these rules will yield a very comprehensive coverage of nutrient timing, but will be sufficiently simple as to be applied across a number of varying circumstances. If you'd like to get more in-depth and pay even closer attention to detail in your own diet, please feel free to take the more advanced recommendations from Chapter 4 and work them in to your diet design.

The act of partitioning daily intake into meals needs to include considerations of four separate variables:

1.) Meal Number

2.) Carb Intake Around Activity

3.) Fat Intake Around Activity

4.) Meal Spread (when to eat meals if not evenly spread through day)

The careful reader will notice that protein timing is not addressed, and that's because it's likely that protein does not have a profound timing effect so long as it is consumed regularly throughout the day.

With meal number, anything between 3 and 8 meals per day is both effective and realistic, but in this discussion we are going to assume a minimal level of dedication to eating for body composition (meaning a 4 meal minimum) as well as put a cap on the more advanced theoretical plans with more than 6 meals. For our example individual, we'll be making a diet of 5 meals per day. The approach is almost identical for fewer meals, as meals can simply be combined and the nutrients spread out evenly. In the first edition of this book, we won't be covering multiple-daily workout diet design in order to limit the scope of this discussion. Just to be clear, cardio is not considered a workout that needs its own special attention outside of consuming a regularly-scheduled meal after completion. When referencing diet design for multiple workouts, we mean multiple weight training or sport-specific sessions per day, not incline walking or other traditional forms of cardio. There can be some argument made for specific

workout window nutrition for HIIT-style cardio, but the advantages would be very small and such a discussion of particulars is best had with a body composition diet and training coach.

Ok, so step one in meal structure design:

1.) Select meal Number, divide protein evenly into meals.

See the following example from our 180lb individual:

5 Meals Per Day		180g/5
	Protein Content Per Meal	
Meal 1	36g	
Meal 2	36g	
Meal 3	36g	
Meal 4	36g	
Meal 5	36g	

Thus for your personal case, simply divide your daily allotted protein evenly between meals.

2.) Plan carb intake around activity

There are 5 different special considerations for carb intake around training, described in detail in Chapter 4. Here they are again:

a.) Pre-training
b.) During-training
c.) Post-Training
d.) Post-Post Training
e.) All other times including non-training days

For the purpose of simplifying the diet design process, we'll treat the intra and post workout window as one and the same, as the ratio of carbs and protein is the same for both in any case. This gives us 4 categories into which to split our daily carbs:

a.) Pre-training
b.) During/Post-Training
c.) Post-Post Training
d.) All other times

The following Table should be followed to apportion daily carbs to the various meal periods:

	Percent of Daily Carbs in Meal		
Meal	Light Workout	Moderate Workout	Hard Workout
Pre-Workout	15%	15%	15%
During/Post-Workout	40%	40%	40%
Post-Post Workout	35%	35%	35%
Rest of Day	10%	10%	10%

The percentage values in the table are a simplified version of the more advanced ratios presented earlier in the text. They also allot a bit of extra carbohydrates to the "rest of day" period in order to assist with enhancing body composition while simultaneously keeping blood glucose drops from making life too miserable.

Applying this table to our example 180lb individual, we get something like the following result:

5 Meals Per Day		Carbs Per Meal by Training Type			
	Protein per Meal	No Training	Light	Moderate	Hard
Meal 1 or Pre-Workout	36g	18g	27g	40.5g	54g
Meal 2 or During/Post Workout	36g	18g	72g	108g	144g
Meal 3 or Post-Post Workout	36g	18g	63g	94.5g	126g
Meal 4 Evening	36g	18g	9g	13.5g	18g
Meal 5 Bedtime	36g	18g	9g	13.5g	18g

An example of the same individual who trains later in the day:

5 Meals Per Day		Carbs Per Meal by Training Type			
	Protein per Meal	No Training	Light	Moderate	Hard
Meal 1 Breakfast	36g	18g	9g	13.5g	18g
Meal 2 Lunch	36g	18g	9g	13.5g	18g
Meal 3 or Pre-Workout	36g	18g	27g	40.5g	54g
Meal 4 or During/Post Workout	36g	18g	72g	108g	144g
Meal 5 or Post-Post Workout	36g	18g	63g	94.5g	126g

As you can see in both examples, non-training days have simply been apportioned an even amount of carbs per meal, as there is no compelling reason to time the carb intake disproportionately.

3.) Plan Fat Intake Around Activity

While carbs are distinctly beneficial in several ways when consumed before, during, and after activity, fats are the opposite. By reducing gastric emptying rates and delaying the digestion of food, high fat contents consumed around the workout window interfere with optimal nutrient absorption, particularly of carbs. Thus, the percent apportioning of daily fats looks like the following:

	Percent of Daily Fats in Meal		
Meal	Light Workout	Moderate Workout	Hard Workout
Pre--Workout	10%	7.5%	5%
During/Post-Workout	0%	0%	0%
Post-Post Workout	10%	10%	10%
Rest of Day	80%	82.5%	85%

The declining amount of fat percentage in the pre-workout meal as training volume escalates is owed to the observation that harder workouts, by requiring more blood be shunted to the cardiovascular system and the working muscles (and away from the GI tract), present a higher risk of GI distress, and thus easier-digested meals (lower in fat percentage) are preferred.

Applying this template to our 180lb example individual for both AM and PM training, we yield the following fat intakes:

5 Meals Per Day		Fats Per Meal by Training Type			
	Protein per Meal	No Training	Light	Moderate	Hard
Meal 1 or Pre-Workout	36g	21.6g	6.8g	5.1g	5.75g
Meal 2 or During/Post Workout	36g	21.6g	0g	0g	0g
Meal 3 or Post-Post Workout	36g	21.6g	6.8g	10.9g	11.5g
Meal 4 Evening	36g	21.6g	27.2g	43.6g	46g
Meal 5 Bedtime	36g	21.6g	27.2g	43.6g	46g

5 Meals Per Day		Fats Per Meal by Training Type			
	Protein per Meal	No Training	Light	Moderate	Hard
Meal 1 Breakfast	36g	21.6g	27.2g	43.6g	46g
Meal 2 Lunch	36g	21.6g	27.2g	43.6g	46g
Meal 3 or Pre-Workout	36g	21.6g	6.8g	5.1g	5.75g
Meal 4 or During/Post Workout	36g	21.6g	0g	0g	0g
Meal 5 or Post-Post Workout	36g	21.6g	6.8g	10.9g	11.5g

You'll notice that with harder training days, the amount of fats in the workout window doesn't rise appreciably, and that extra carbs make up almost the entire calorie addition harder training days.

4.) Plan Meal Spread

The spreading of meals out over the course of the day is simple when the day is a non-training day, but is helped by more particular recommendations during a training day.

During non-training days, meals should be consumed evenly throughout the day if possible. Thus, the first meal should be consumed upon waking, the last meal just before bedtime, and all remaining meals spread evenly in between.

On training days, this table can help act as a guide for the first creation of a meal timing plan:

	Meal Timing
Pre-Training Meal:	1-3 hours before training
During/Post Training Meal	1/3 of nutrients during the workout, 2/3 within a half hour of completion
Post-Post Training Meal	2-3 hours after post-workout meal
Rest of Day Meals	Spread evenly within non-workout window

Applying these guidelines to our example 180lb individual, we can, for the first time, construct something like a rudimentary meal plan that takes into account calories, macros, and timing. We'll base this off of his "moderate workout" and a non-training day to keep the charts from becoming overwhelming. Here's the result:

	5 Meals Per Day	**Moderate Training AM**		
		Protein	Carbs	Fats
8:00am	Meal 1 Pre-Workout	36g	40.5g	5.1g
11:00am	Meal 2 During/Post Workout	36g	108g	0g
3:00pm	Meal 3 Post-Post Workout	36g	94.5g	10.9g
7:00pm	Meal 4 Dinner	36g	13.5g	43.6g
11:00pm	Meal 5 Bedtime Meal	36g	13.5g	43.6g

	5 Meals Per Day	**Moderate Training PM**		
		Protein	Carbs	Fats
8:00am	Meal 1 Breakfast	36g	13.5g	43.6g
12:00pm	Meal 2 Lunch	36g	13.5g	43.6g
3:00pm	Meal 3 Pre-Workout	36g	40.5g	5.1g
6:00pm	Meal 4 During/Post Workout	36g	108g	0g
10:00pm	Meal 5 Post-Post Workout	36g	94.5g	10.9g

	5 Meals Per Day	**Non-Training Day**		
		Protein	Carbs	Fats
8:00am	Meal 1 Breakfast	36g	18g	21.6g
12:00pm	Meal 2 Lunch	36g	18g	21.6g
3:00pm	Meal 3 Afternoon Meal	36g	18g	21.6g
7:00pm	Meal 4 Dinner	36g	18g	21.6g
11:00pm	Meal 5 Bedtime Meal	36g	18g	21.6g

Looks pretty good, and hopefully the diet you've been designing as you follow along does as well! But what's missing? Actual food options! That's where the next section of Food Composition comes in!

Determining Food Composition (Making Dietary Choices)

In determining the actual composition of your food, we have to consider the three major macronutrient categories of food separately:

1.) Protein Composition

From the technical descriptions in the earlier chapters, it is clear that animal protein is a better source for body composition, which is why we recommend using primarily lean meats for protein sources. However, there are two special times where we deviate from this recommendation: the workout window and the last meal of the day.

During the workout window, it's probably best to select whey protein for its rapid and easy digestion and absorption, as well as its ease of consumption in a shake, which can be done during and after the workout. The whey protein that constitutes the "during/post workout meal" is best mixed with water and consumed approximately one third during the workout and the remainder right after.

Because of the length of time between the bedtime meal and breakfast many protein sources simply do not digest slowly enough to provide a steady stream of amino acids through the night. For this purpose, casein protein is an excellent choice since it can take over 6 hours to fully digest, and even longer if fats are present in the meal. Thus using casein protein as the protein source in the last meal is recommended for body composition enhancement. Dairy sources can be consumed as long as carbs are allotted in the meal. If it's a very low carb meal, some dairy may not be appropriate. Here is a list of common protein sources. This list is NOT exhaustive:

Lean Protein Sources
Any fish (tuna, salmon, etc…)
Any seafood (shrimp, scallops etc)
Chicken breast
Turkey breast
Any beef 90% or leaner
Any steak 90% or leaner
Any turkey 90% or leaner
Egg Whites or Egg Substitute (2 egg whites = 1oz meat)
For meats: 2oz = 12g protein, 3oz = 18g protein, 4oz = 24g protein
5oz = 30g protein, 6oz = 36g protein, 7oz = 42g protein

2.) Carb Composition

There is some evidence that more glycemic carbs are beneficial during/after workouts, and that low glycemic carbs are best at other times. Additionally, the consumption of even high GI carbs *during* the workout can be quite distressing to the GI tract, so the recommendation is to consume them in liquid form, which also benefits hydration. For hydration AND carb/protein benefits, try to mix your carbs into water with a 6% solution. That means that for each liter (32oz) of water, 60g of total carbs AND whey protein can be mixed. For some, this may be far too much liquid and should be pared down to tolerance, but it's a recommended start. Here are some typical carb sources for the workout shake, to be consumed with whey protein one third during and two thirds right after the workout:

Workout Shake Carbs
Gatorade
Lemonade
Dextrose
Advanced High GI Powders
Fruit Punch
Kool Aid
Any Fruit Juice

Outside of the workout window, low glycemic carbs that are high in fiber and micronutrients should be used as the bulk of intake, with an example (non-exhaustive) list here:

Low GI Carbs
Whole grain bread
Brown rice
Whole wheat pasta
Oatmeal
Sweet Potatoes
Quinoa
Any fruit

In addition to the low GI carbs, most non-workout window meals will benefit from containing about a cup (at least) of green veggies. These add almost no calories, but supply a lot of fiber and micronutrients for both health (mostly) and performance (somewhat). Here's a typical range of sources, non-exhaustive as well:

Veggies
Broccoli
Spinach
Lettuce
Onions
Tomatoes
Green Peppers
Asparagus
Cabbage
Cauliflower
Celery
Cucumbers
Green Beans
Portabella Mushrooms
Yellow Squash
Zucchini
1 small handful = 1 cup

3.) Fat Composition

Fats come in all sorts of varieties, and differentially effect health and performance. While trans-fats should be almost wholly avoided, monounsaturated sources have the most evidence to their health effects and should compose the majority of the added fats in the diet. Because lean meats have mostly saturated fats in what fats they do have, adding additional saturated fats may not be necessary or healthy. There may be some healthier saturated fat alternatives, but the data in support of their benefits is not yet clear enough to make a recommendation. The typical healthy fat sources can look like this (non-exhaustive) list:

Healthy Fats
Small handful of any nuts
1/2 avocado
1 tbsp olive oil
1 tbsp canola oil
2 tbsp any natural nut butter
1 serving apprx = 15g fat

A finished training day and off-day diet for our example 180lb individual would look something like this:

Non-Training Day		Protein Amount:	Veggie Amount:	Healthy Fat Amount:	Healthy Carb Amount:	Workout Carb Amount:
Meal:	**Time:**					
Meal 1	Waking	5oz any lean protein source	1 small handful greens	1 serving healthy fats	15g carbs	
Meal 2	12:00pm	5oz any lean protein source	1 small handful greens	1 serving healthy fats	15g carbs	
Meal 3	3:00pm	5oz any lean protein source	1 small handful greens	1 serving healthy fats	15g carbs	
Meal 4	7:00pm	5oz any lean protein source	1 small handful greens	1 serving healthy fats	15g carbs	
Meal 5	Bedtime	35g casein protein in water		1 serving healthy fats		

Moderate Training PM		Protein Amount:	Veggie Amount:	Healthy Fat Amount:	Healthy Carb Amount:	Workout Carb Amount:
Meal:	**Time:**					
Meal 1	Waking	5oz any lean protein source	1 small handful greens	2.5 serving healthy fats	10g carbs	
Meal 2	12:00pm	5oz any lean protein source	1 small handful greens	2.5 serving healthy fats	10g carbs	
Meal 3	3:00pm	5oz any lean protein source	1 small handful greens	1/2 serving healthy fats	40g carbs	
Meal 4	6:00pm	35g whey protein in water	(start with training, 1/3 during training, 2/3 right after)			105g carbs
Meal 5	10:00pm	35g casein protein in water		1/2 serving healthy fats	90g carbs	

Determining Supplement Use

Because supplements are not particularly powerful in their effect on body composition, and because there are so few that work with a high probability, and powerfully enough to be worth the money, this section is rather short!

The following is a bulleted set of recommendations for the proper use of all of the “effective supplements” listed earlier in the book.

- Whey Protein

Whey protein should be used in the workout shake, but its fast digestion and absorption rate make it a poor meal replacement. Mixing whey and casein together can solve this problem if whole food protein is not available or convenient to eat. Whey protein should probably be taken year-round, with no hypothetical benefits of eliminating it from the diet temporarily.

- Glycemic Carb Supplements

Already listed in the discussion of food composition above, these drinks and powders should always be used in the workout window, and due to their high GIs, probably not at other times.

- Creatine

Creatine is effective for enhancing body composition, and should be taken as monohydrate at 5g per day for individuals under 250lbs and 10g per day for individuals over 250lbs. It can be taken at any time of the day, with food or without. Two months of taking creatine with a month break may be able to allow the body to better retain its natural creatine production levels, and a loading phase of consuming 20g of creatine per day in 4 divided doses for 5 days may be effective at allowing creatine to begin exerting beneficial effects sooner rather than later.

- Stimulants

Stimulants can be used pre-workout or in two divided morning and afternoon doses in order to boost workout or daily energy, burn a bit more calories, and curb hunger. Please use discretion and only take the recommended dose of pre-workout or fat burner formulas, and always ease in to consumption. Higher dose stimulant use should be alternated with lower dose or no stimulant use periods, perhaps with a 3-1 monthly rotation to start.

- Casein

When long breaks between meals (more than 5 hours) or sleep is planned, casein is a good choice for allowing sustained amino acid release for long durations, especially if fats are included. Use of casein can be continuous.

Adjusting and Altering your Diet

All the way up through the discussion of dietary design, we have been constructing a baseline maintenance diet. There are three distinct changes to make from this diet:

- Adjusting the maintenance diet to keep weight stable

- Adjusting the diet to lose weight

- Adjusting the diet to gain weight

1.) Adjusting the maintenance diet to keep weight stable

Because the formulas and tables presented here are only a rough estimate for the average person of a given weight and body composition, some adjustments will need to be made for people of faster and slower metabolisms and varied activity levels.

Those with a faster metabolism or higher daily activity should increase calories in their diet by 250-500 per day if they are steadily losing weight on the baseline plan. Those calories should come from mostly

added healthy fats (in keeping with nutrient timing, mostly outside the workout window). If you happen to be very active, addition of carbs around times of activity can also contribute to these calories. Once an adjustment has been made, 4-7 days (2-3 bodyweight recordings) should elapse before further changes are made and another 250-500 calories is added in the same fashion as the first addition.

Those with a slower metabolism should seek to reduce daily calories by 250-500 per day, and do so almost exclusively from fats so that carbs can still fuel the training process. Just like in unexpected weight loss, 4-7 days should elapse after every calorie cut to assess response before proceeding with another cut or stabilizing. Remember that 2-5lbs of daily weight fluctuation due to timing, scale error, salt, and water is normal, so don't start cutting or adding calories with only one measurement as data.

2.) Adjusting the diet to lose weight

When losing weight, calories should be lowered by 250-500 calories per day for those weighing less than 200lbs and 500-1000 calories per day for those weighing over 200lbs. To conserve energy and glycogen stores as well as muscle mass, almost all of these cuts should come from fat intake reductions. If weight loss proceeds at the desired pace of 1-2lbs per week, no added changes are necessary. Just like in adjusting the maintenance diet, a period of 2-3 weigh-ins should inform the next adjustment decision. It must be mentioned that increasing calorie expenditure from performing more exercise and activity should almost always be done along with reductions in food intake. If you have to cut fats to a daily total approaching 10% of your bodyweight in pounds (20g of fat for a 200lb individual) to stay on track of 1-2lbs per week weight loss, you can begin to cut carbs, but it is also recommended that you seek professional consultation from a physique diet coach at that point.

3.) Adjusting the diet to gain weight

When gaining weight, calories should be raised by 250-500 calories per day for those weighing less than 200lbs and 500-1000 calories per day for those weighing over 200lbs. To conserve insulin sensitivity, almost all of these additions should occur via fat intake increases. If weight gain proceeds at the desired pace of 1-2lbs per week, no added changes are necessary. Just like in adjusting the maintenance diet and weight loss diet, a period of 2-3 weigh-ins should inform the next adjustment decision. If you have to make more than a 50% increase in total calories from your maintenance intake to stay on track of 1-2lbs per week weight gain, it is recommended that you seek professional consultation from a physique diet coach.

Cheat Meals

Cheat meals are meals of planned deviation from the strict macronutrient composition of the usual meal in that time. As opposed to eating brown rice and chicken, you might have pizza and ice cream. There are a couple of points to make about cheat meals, which can inform your choice to use them or avoid them:

1.) Cheating is almost always understood as having high calorie intake per meal. Eating just the usual 500 calories per meal of pizza sometimes literally means a slice and a half of pizza, which in a

hypocaloric diet gives you just enough of taste of the good life to make you MORE miserable, not less, on the average. IIFYM ("If it fits your macros") is an ok way to go, but then you've likely got to cut out nutrients from other meals earlier or later in the day if you want to eat something substantial for your cheat meal.

2.) From a physiological standpoint, it is *by no means clear* that cheating causes any meaningful and beneficial effects to your fat loss diet progress. It might boost the metabolic rate for the next several hours, but all effects seem very transient, and the calories in the cheat meal more than overwhelm that rate increase, making the meal net-hypercaloric and not helping. There is SOME hypothetical basis for increasing carbs every several days or weeks, but a cheat meal loaded with extra fats is not really needed for that… the carbs can simply be more of the regular, healthy kind.

3.) From a psychological perspective, it is *by no means clear* that cheating causes any boosting effects on mood or motivation. In many of our clients it has actually caused the reverse by re-igniting cravings and radically escalating hunger. Bland food has been shown to decrease voluntary food intake, so it may actually be the way to go for the duration of the cutting diet.

4.) If alcohol is consumed with a cheat meal (or at any point in general), it should be understood that this is a tradeoff for best results. Alcohol impairs muscle growth and fat loss simultaneously, so the best recommendation here is: the less, the better.

Taking the above into consideration, it really comes down to how *you personally* respond to cheat meals. If your weight loss is on track and they keep you sane, enjoy. If they curb weight loss and seemingly make you a cravings-machine just living for your next cheat meal, they are best avoided. Scientifically, they are *not* a "must" by any stretch of the imagination.

Lifestyle Factors

In order to be most successful in achieving your desired body composition, the most important variables are of course proper nutrition and training, probably in that order. However, the maximization of results can be greatly affected by other variables, the three most important of which are discussed in abbreviated terms below. If you follow the proper dieting principles, train hard and smart, and get it right on these three additional variables, your body composition stands the best chances of improving to the extent you want.

1.) Sleep

Getting a proper amount of sleep is considerably important to body composition outcomes. Not only does a lack of sleep lead to a reduction in the energy you can put into training hard, but it also has an independent negative effect on body composition. That is, *even* if you can still train hard, chronic lack of sufficient sleep promotes an environment of high levels of stress hormones and low levels of anabolic hormones. Thus, lack of sleep has actually been shown to increase fat stores and risk muscle loss.

How much sleep is enough? The average seems to be about 8 hours per night, but that can vary substantially from person to person. In reality, *enough* is enough. You know when your eyes are sore and you're constantly dozing off that you are behind on sleep, so get what you need. An important note here is that an over-abundance of sleep is not necessarily beneficial. Thus, you don't need 11 hours of sleep per night in most cases. Get the sleep you need, get it regularly, and your results will come much more predictably.

2.) Stress

High stress levels are ok so long as they are periodically brought back down to normal. For example, it's not really going to interfere with your appearance if you have a high-impact job, SO LONG AS you take the time (usually every day in some small ways and over the weekend in bigger ways) to rest, relax, and bring the stress levels back down. Conversely, a constant level of cumulative stress that goes unchecked for weeks will almost certainly have a negative impact on your physique, mostly via its elevation of stress hormones (cortisol, etc…) and its reduction of anabolic hormones (testosterone). Chronic high levels of stress lead to higher body fat percentages and lower muscle growth retention rates. As with sleep, make sure to bring stress down as often as needed so that you feel calm and in control at least some of the time! It's not just a mental issue… high stress levels will have a poor effect on your body composition even if you eat right and get all of your usual training in. In order to look the best you can, do what it takes to manage stress. Oftentimes, this means relaxing with your family and friends, or just taking some alone time. This is the easiest stuff of all, so get to it!

3.) Consistency

Of all the topics discussed in this book, the following is the least controversial: doing the right kind of diet and training part-time will have almost no impact on your physique. That's right, only dieting well for 5 days a week and then completely falling off the wagon on the weekends may actually result in almost no improvement whatsoever. The body seeks homeostasis (keeping body systems and tissues stable over the long term) and it will quickly revert to its untrained and undieted form when given the opportunity. The single most important ingredient to diet success turns out to actually be consistency, rather than any recommendation in particular. What's the use of a calorie deficit if it's only stuck with half of the time, and a surplus the other half? If you're taking the time to read this book to try and change your diet approach, you might as well give yourself the best chances of succeeding by *sticking to the plan you make!* Now, consistency does not have to be perfect, but the more, the better. If you used to have 5 days of diet adherence per week and now you're up to 6, your results will be better still. The most muscular and leanest people didn't accomplish their levels of development overnight. They were the ones that did *mostly* the right things day in and day out for months and years. If you want to have the body you desire, this book can greatly help you formulate a diet for that goal. After that, it's up to you (and only you) to be consistent in following that diet.

Sources and Further Reading:

1.) Diet and exercise superior to diet alone:

http://www.ncbi.nlm.nih.gov/pubmed/24409219

2.) Cheat meals:

http://www.ncbi.nlm.nih.gov/pubmed/17466108

http://www.ncbi.nlm.nih.gov/pubmed/1799281

http://www.ncbi.nlm.nih.gov/pubmed/15919830

3.) Alcohol:

http://www.ncbi.nlm.nih.gov/pubmed/1804130

http://www.ncbi.nlm.nih.gov/pubmed/8184963

http://www.ncbi.nlm.nih.gov/pubmed/1957830

4.) Sleep:

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2951287/

Chapter 10: Common Diet Myths and Fads

While there is a lot of very good information available through various media in regards to dieting to enhance body composition, there is unfortunately also a considerable volume of misinformation. In this section, 8 currently popular dietary myths are briefly discussed and analyzed on their scientific merits. Many of these myths are rooted in the naturalistic fallacy which is a logical fallacy that claims that because something is natural, it must also be good, and if something is artificial, it must be bad. In dieting for body composition, many of the pervasive but unmerited practices result from an application of this fallacy in the form of the assumption that everything that is natural must also enhance body composition, and vice-versa for artificially enhanced foods.

It turns out that in reality, building muscle and losing fat are two processes that most human physiology prefers to avoid. In fact, a natural instinct of humans (to eat lots of delicious, calorie dense foods and avoid hard physical exertion) seems to push in the opposite direction, and in fact towards muscle loss and fat gain. Interestingly, the only reason pre-modern humans or those living in more traditional societies are lean (none of them are muscular by modern standards) is because of the demanding physical nature of their work and way of life, and the relative paucity of calories to allow weight and fat gain to occur in the presence of such physical activity. As soon as these populations are presented with mechanized agriculture and more money for food, they begin to gain weight. So, it's not the type of food they are eating that gives them the ability to be lean... It's that they expend lots of calories in physical activity and eat a diet low in calories. Outside of that, there is not much of an effect, if at all, of more 'natural' diets on body composition.

That being the case, let's examine some of the common diet fads on their own merits, keeping the naturalistic fallacy in mind.

Anti-Grain/Gluten

While in the 80's and 90's it was fashionable in certain circles to claim that whole grains are healthy and enhance body composition (which is indeed at least partially true, owing to their high micronutrient and fiber content and their low glycemic index on average), a modern food movement claims that grains are in fact responsible in large part for the obesity epidemic.

In reality, inactivity (due to industrial mechanization) and overeating (due to the falling price of an ever growing variety of foods designed to be as delicious as the consumer demands) are actually to blame for the obesity epidemic, and grains have no magical role in making people fatter. This has been confirmed in numerous investigations and is quite evident simply from the observation of vegetarians (who eat lots of grains but are some of the smallest and leanest people around).

Gluten (a protein most notably found in wheat) has received some blame as of late as an agent of body composition destruction. However, gluten only negatively affects those with allergies and sensitivities to it, which is a fraction of the population that *very* charitably makes up less than 5% of all people in the United States and most other western nations. Included in this group are those with Celiac Disease, which can cause symptoms including seizures, skin rash, vomiting, and extreme fatigue. Those with this

condition are absolutely in great need of reducing gluten intake. Those without Celiac Disease but with possible sensitivities or allergies to gluten may actually have trouble digesting gluten, which may cause bloating and GI distress. This effect actually doesn't allow some of the calories of gluten to be absorbed which, if anything, can lead to *less* body fat accumulation, not more as is often claimed.

As long as calories and macronutrient amounts are set properly, grains (especially whole grains) are an absolutely fine ingredient in a diet designed to enhance body composition.

Anti-GMO

The resistance to consuming genetically modified organisms (GMOs) is perhaps the most straightforward presentation of the naturalistic fallacy imaginable. All sorts of problems have been proposed with GM foods, and of course a propensity to add body fat and strip away lean mass has been mentioned.

This particular fallacy is interesting, as those in vehement support of it seem to be of the opinion that plants and animals, in no way looking out for human health, safety, or performance, can be expected to enhance all of those just by the sheer semi-directed processes of evolution. While conversely, scientists working for years on altering a plant or animal in such a way as to make it safe and effective for human consumption, motivated by wealth, fame, and career security (and on the other end by lack of wealth, mass demonization, and possible legal action), while using all the best modern tools of science including formal logic itself, are likely to design poisons and foods that otherwise interfere with beneficial body functions.

But philosophy aside, direct testing over decades has revealed that GM foods are safe for human use, and in fact in no way interfere with the quest for optimal body composition.

Anti-Hormone/ Antibiotic

Conventionally farmed cattle often receive doses of anabolic steroids and growth hormones in order that they produce leaner meat and more of it. Those interested in eating for body composition have at times been reluctant to consume beef that had been conventionally farmed for this reason. There are two distinct problems that make this view unlikely to be justified.

1.) Hormones are not orally bioavailable if not specially modified for oral consumption. All of the hormones present in cow meat (of which there is a very tiny amount) get digested in the GI tract and liver like any other proteins and fats, and are not detectable in human blood after consumption, certainly not in any medically relevant amounts.

2.) If by some miracle these hormones did pass the human gut and enter the bloodstream, they would ENHANCE body composition, not detract from it. The same hormones that make the cow leaner and more muscular do the same thing in humans, which is why elite strength athletes inject the very same

hormones on a regular basis. But... They inject them... Drinking vials of growth hormone and trenbolone (the most common steroid administered to cattle) would be one of the most simple and effective ways to waste money ever devised, short of burning it.

The same conventionally-farmed cattle that are administered hormones are also often given antibiotics. Some fear that the presence of these medicines in their consumed meat products will result in deleterious effects, but the evidence is quite to the contrary, as no negative effects have been established. Antibiotics degrade over time, and in addition to that are found in absurdly tiny amounts in meat itself, with no demonstrated consequence to the meat eater so far, and certainly not in regards to body composition.

Vegetarian/Vegan

With the recent popularity of 'ancestral' diets that emphasize meat consumption and deemphasize grain consumption, the usually-popular vegetarian and vegan diets have seen a slightly lowered popularity in the diet world. Vegetarian and vegan diets still maintain a considerable popularity, and are occasionally touted as superior for body composition enhancement. The evidence for their effectiveness in this regard is usually the claim that consistent vegetarians and vegans are almost never overweight (which is in fact true), and leaner than the general population (which is likely mostly because they are lighter in bodyweight).

It is in fact true that vegan and vegetarian diets are likely good choices for keeping bodyweight low. In addition (and in part because of the aforementioned low bodyweights), vegetarian and vegan diets are also quite health-promoting, especially in regards to the longevity of their strict adherents.

However, while these diets are sound and healthy when properly followed, they are not the best approaches to body composition enhancement. Muscle mass gains occur best with animal protein sources, and the calories required for extensive lean mass gains are also much more easily supplied via meat products. There is also some evidence that diets rich in animal products meaningfully elevate serum testosterone, which may enhance gains in muscle mass and losses in body fat, especially over the longer term.

Vegetarian and vegan diets can be modified (vegetarian ones in particular) to be more supportive of body composition changes, mostly with the intentional increase in protein consumption which can be done through foods or supplements like soy protein. The vegetarian and vegan approach is certainly a fine one for body composition enhancement, but is much more appropriate for smaller individuals. Those seeking higher levels of muscularity or seeking to compete at a high level in sport of any kind will be best served by eating an omnivorous diet.

Anti-Processed

Processed foods are bad. Everyone knows this. Except for soy protein powder and whey... Those are

good for you. And they are processed. Hmmmm ok something is off!

Processed foods are almost universally shunned in the body composition diet world, but this attitude is often hypocritical, as illustrated above. The truth is, processed foods are often poor choices for body composition enhancement, but it's not because they are processed that they are not the best, it's mostly because of the ingredients used and the effect of certain kinds (but not all) processing. Generally speaking there are three possible downsides to processed foods:

1.) The inclusion of trans fats. These fats tend to promote higher adiposity, lower muscle mass and poorer health outcomes than other fats.

2.) Enhanced flavor and ease of consumption. This leads to much easier overeating risk and can disrupt sound dieting practices.

3.) The raising of the glycemic index of the food. Processing, which often removes fiber and reduces complex carbohydrate to more simple ones, can raise the GI of included carbs. This can lead to a slightly enhanced adiposity of the food, especially if consumed outside of the workout window. Higher GIs can also make the eater hungrier sooner by clearing the blood faster, which can in turn promote the consumption of more daily calories than otherwise.

The implication of these downsides is that processed foods are not necessarily bad, and not at all bad if the above criteria are avoided or mitigated. For example, beef jerky is quite processed, but can be trans-fat free and have almost no carbohydrates, let alone glycemic ones. And because it has lots of protein (which tends to be more satiating than carbs or fats), is not a very tempting food with which overeating is a risk. Whey protein powder is of course incredibly processed, but carries none of the above negatives, and Gatorade is actually quite good for body composition enhancements if its glycemic carb content is only consumed in the workout window. Thus, the verdict on processed foods is a situational one. If they have trans fats, glycemic carbs, and are delicious enough to risk a diet break, they should be mostly avoided for body composition goals. Otherwise, they are just fine to consume, especially at the right times.

Anti-Carb

While many of the fad diet approaches listed here are recent or only popular within smaller sport niches, low-carb dieting has been popular with large segments of the fitness community for a very long time. In particular, diets that advocate very low carbohydrate intakes (less than 10% of total calories) have enjoyed considerable popularity in the past, and regularly experience significant popularity resurgences.

Low carb diets are certainly effective in promoting fat loss so long as calories are taken in at a hypocaloric level. However, with a certain level of calorie deficit, attempting to eat a very low carb diet results in extra fat and protein having to make up for the missing carbs (given ANY calorie intake, low-carb diets must be composed of either more fat, protein or both than calorically equal diets containing

more carbs).

Granted that low carb diets have less carbs than calorically comparable diets but more fats and proteins, the question of cost-benefit must be asked. And for us, that question has already been answered via the caloric constrain hypothesis (CCH). The CCH states that at any level of calories intake, more of one or two nutrient necessarily implies less of another.

In the context of low-carb diets, at any given calorie level, is it better to have more carbs, or rather more fats and/or proteins? If carbs start out very low, the answer is almost certainly that more carbs would be of benefit. Protein over the optimal intake does not offer any distinct benefits, and fats over the minimal values certainly don't offer the same benefits as carbs do up to their optimal level of intake. However, the more carbs that are consumed, especially on a hypocaloric diet, the more energy there is for training, the more insulin there is for anabolic stimulus, and the more glycogen there is for future intense training, recovery, and anabolism. Cutting carbs disproportionately from a diet results in a needless reduction in muscle retention and growth (carbs), a needless increase in nutrients that don't help nearly as much with muscle retention past their optimal (protein), and minimal (fat) intakes.

Intermittent Fasting

Intermittent fasting, a recent diet fad, claims that avoiding food entirely for large time frames during the day is a desired strategy, especially for fat loss. Intermittent fasting suffers from three rather significant drawbacks:

-Amino Acid Availability

Because there is no reserve storage of amino acids in the human body, when amino acids are not available from the GI tract, they are catabolized from other tissues. The most common tissue of catabolism is unfortunately muscle tissue. Thus, not consuming protein-containing foods for longer than 8 hours on end almost guarantees that muscle will be used to fill the amino acid gap. It is also by no means clear that later consumption of amino acids can make up for the short term losses by growing back the lost muscle at unusually high rates. Thus, intermittent fasting is probably best avoided by those seeking to lose fat while attempting to conserve muscle, as it seems to risk muscle unnecessarily.

-Pre-Training Fuel

Many of the most popular intermittent fasting protocols call for fasted training (with food intake only being provided after training and not before). The biggest problem with this approach is that training volume and intensity will almost certainly suffer, and both are critical to both muscle retention and fat loss. The research on pre-exertion eating is rather straight forward; fasted training almost always results in poorer volume and intensity exertions than training in the fed state. Eating a meal (carbohydrate inclusion is a very good choice but *anything* seems to work better than nothing at all) 2-4 hours before training almost always increases the productivity of that training. Those serious about body composition

enhancements must be prepared to train long and hard, and fasted training is simply not conducive to this practice.

-Lifestyle Issues

Some proponents of intermittent fasting have extolled its advantages for the busy schedules of real-world people. We're not all fitness professionals, and not all of us have time to eat 8 perfectly balanced meals per day. This is true as far as it goes, but intermittent fasting advocates take it a bit too far. While eating multiple times at many job sites is inconvenient or simply not possible, not eating at all during the day is a surefire way to promote poor energy levels, both physical and mental. With *no food* coming in, after a long work day, all of the coffee in the world can't restore the focus and energy levels needed for best work performances. Yes, eating fewer meals at work may be more convenient than and just as effective as eating every 2 hours, but not eating at all during the day is probably neither convenient nor effective.

Main Points and Real World Tips
- If a diet brands a certain food ingredient or production type as categorically evil… be wary - Just because something is natural, that does not make it healthy or effective - Just because something is artificial, that does not make it unhealthy or bad for body comp - Use reason and scientific evidence to examine new claims about foods and diets

Sources and Further Reading:

1.) Anti-Grain/Gluten:

http://www.nsca.com/uploadedfiles/nsca/inactive_content/program_books/ptc_2013_program_book/aragon.pdf

2.) Anti-GMO:

http://www.ncbi.nlm.nih.gov/pubmed/24041244

3.) Anti-Hormone/Antibiotic.

https://www.globaldairyinnovation.com/_layouts/downloads/Recombinant%20Bovine%20Somatotropin%20(rbST)%20-%20A%20Safety%20Assessment.pdf

http://www.ncbi.nlm.nih.gov/pubmed/17486224

http://www.ncbi.nlm.nih.gov/pubmed/11505585

http://www.ncbi.nlm.nih.gov/pubmed/9167248

4.) Vegetarian/Vegan:

http://www.ncbi.nlm.nih.gov/pubmed/8842068

5.) Anti-Processed:

http://www.ncbi.nlm.nih.gov/pubmed/11978675

http://www.ncbi.nlm.nih.gov/pubmed/17636085

http://www.ncbi.nlm.nih.gov/pubmed/15113737

http://ag.arizona.edu/pubs/health/foodsafety/az1082.html

http://www.ncbi.nlm.nih.gov/pubmed/20725924

6.) Anti-Carb:
http://www.ncbi.nlm.nih.gov/pubmed/21558571

http://www.ncbi.nlm.nih.gov/pubmed/20489032

http://www.ncbi.nlm.nih.gov/pubmed/22674476

http://www.ncbi.nlm.nih.gov/pubmed/22301840

7.) Intermittent Fasting:

http://www.ncbi.nlm.nih.gov/pubmed/21410984

Closing: Using the Diet Principles to your Advantage

Over the last 10 chapters, all of the major principles of dieting for body composition were described, often in great detail. As with all fields of knowledge, the fundamentals are most important, and understanding them should be a priority when reading about any topic.

The fundamentals of this book are the principles themselves. Understanding how calorie balance, macronutrient amounts, and the other principles can be used to get you leaner and more muscular is the most fundamental message of this book.

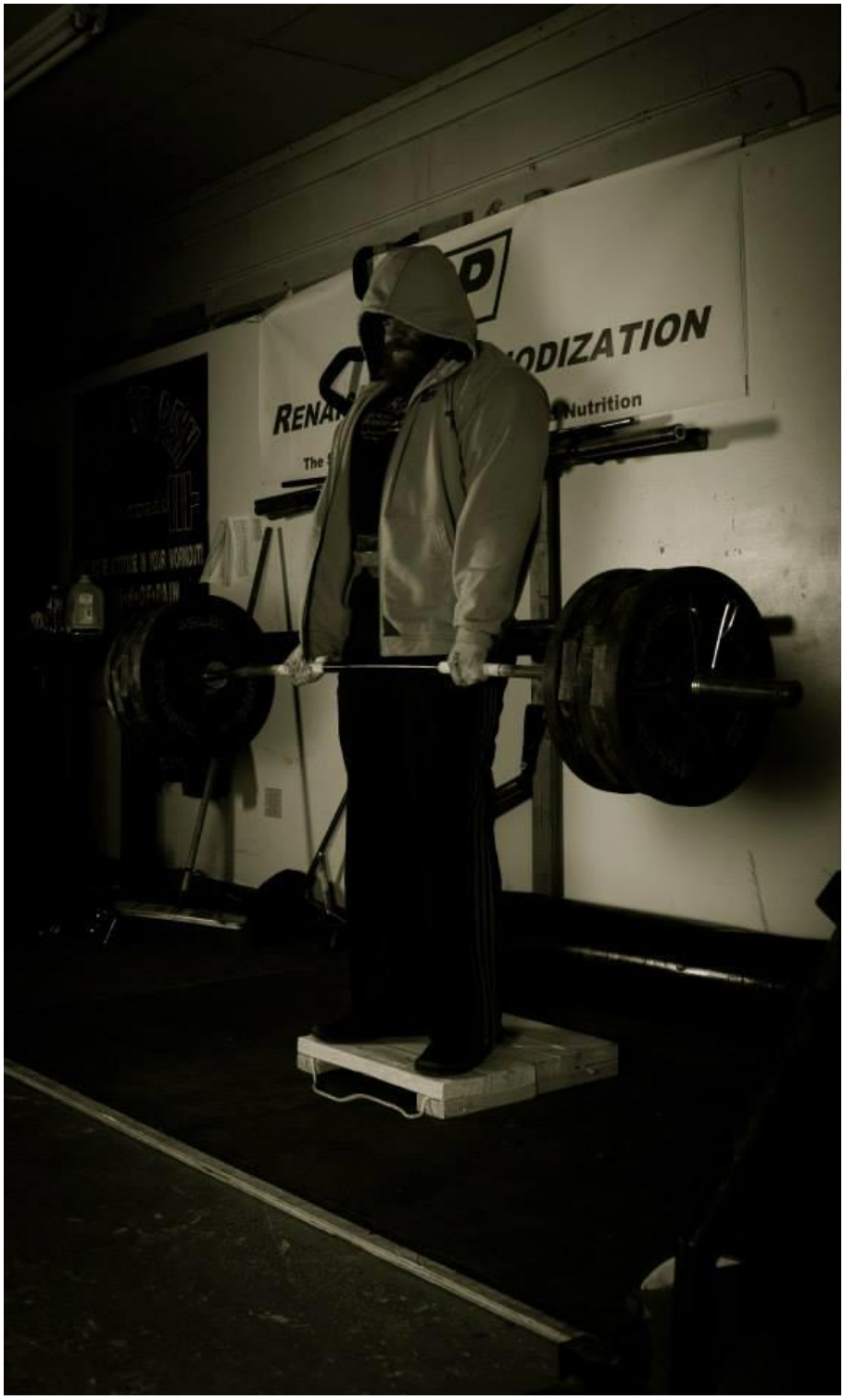
While the fundamental message is of greatest importance, there is another prominent message in this book that bears emphasis. It's not *just* about knowing how the diet principles work and how to alter them for positive outcomes, but knowing *when* to do so. That is, knowing which ones have the greatest effect, which ones have the least, and everything in between.

Because there are only 24 hours in a day, we all have to live within certain constraints. We can't possibly be involved in every job, hobby, and athletic activity we'd like, because choosing certain options crowds out others. Just the same, we can't always commit ourselves to designing and executing the perfect diet, even if getting leaner and more muscular is a high priority. In the real world, perfect dieting that employs all of the principles is a rare luxury, and knowing to which principles to dedicate your often-limited efforts can mean the difference between improvement and stagnation. Understanding which diet principles are most important can allow you to maximally use your finite time and efforts to create the most impressive looking physique that *your* real-world life will allow.

Cheers to the application of science, and best wishes in your fitness journey!

- Mike Israetel

Chapter 11: BONUS Trinity Powerlifting Templates



Just as dieting for body composition can be approached by an analysis of the principles involved, so can training for any and every sport. At Renaissance Periodization, we work with all kinds of different athletes, among which are numerous powerlifters. It just so happens that powerlifting training is quite conducive to a relatively simple, principled approach and this will in fact be the topic of our next book!

Training for powerlifting of course has its complexities and subtleties, but the general approach for best performances in raw powerlifting (no use of special supportive equipment such as bench shirts and squat suits) is relatively well understood from a theoretical perspective. That is, the underlying principles of raw powerlifting training and program design are understood well enough to be communicated in a straightforward way. In the next book, powerlifting training will be discussed in great scientific depth, but we will also derive real life programming that can be easily employed to make consistent gains in platform poundage.

As a preview of this upcoming work, presented next are the programming templates for the three distinct phases of powerlifting performance; hypertrophy, basic strength, and peaking. These templates are designed with a typical seasoned middleweight lifter in mind (3-5 years of training, 198lb class, drug free), so they are just a sample that can be tweaked to your needs, not a holy grail to follow without modification. In the powerlifting training book to come, detailed explanations of how to tailor the basic templates to *your* particular needs will run many pages in length.

So, without further ado, the "Trinity Templates,' so named because the first ever successful detonation of a nuclear device was code named "Trinity," and if you use the templates well and train hard, even a nuclear weapon will pale in comparison to your new powers! Enjoy!

Basic Background Rules:

1. Exercise Performance

When performing all exercises, make sure to never jerk or heave the weight by using momentum. Also, make sure full range of motion is *always* used. Execute the proper technique on all of the movements, which usually means a big chest, retracted shoulder blades, and a neutral or arched lower back. Breaking technique will only get you hurt in the long run, not stronger.

2. Warming Up

Before training with weights, take 5-10 minutes and do a fast incline walk on a treadmill to get a sweat going. For each exercise in your routine, start with reps of 8-10 with very light weights and move up in weights as you move down in reps with each set over the course of 3-6 progressively heavier and lower rep sets. You'll eventually warm up to single with your working weight for that exercise before you begin. Stronger lifters almost always require a more extensive and incremental warm up, with much more particular instructions in the book to come.

3. What is “3 from fail” and how do I reach that point?

In the first week of training, you should not be trying to get as many reps as you can. If you do as many reps as you can on the first week (going to “muscular failure” where you can’t get any more reps in a set while maintaining good technique), your fatigue levels will rise to suboptimal levels, impairing adaptation for the rest of the mesocyle of training.

Stopping several reps from muscular failure allows us to make a proper stimulus, but avoid unwanted fatigue accumulation. A good rule of thumb to determine where “3/fail” is can be applied by stopping the set when the weights start moving much slower and stability becomes difficult. At that point, most people have about 2-4 reps in them before they reach failure.

Sets done “2/fail” and “1/fail” work on exactly the same principle, but are more relatively intense, as you’ll push yourself just a bit closer to muscular failure.

4.) Deload Week

The last week of every mesocycle is designed to reduce fatigue while conserving adaptations. When properly performed, this week will allow you to gain all of the adaptations stimulated in the first several weeks as well as recovering your body so that you can train hard again next month. The first part of the week is usually very heavy and the second is very light, but for both parts of the hypertrophy and strength phases, only HALF of the reps performed in the first two sets of the last hard week should be done. It will sometimes feel like a waste of time but rest assured, it is both essential and maximizes results in the medium and long-term.

The Templates: Hypertrophy Phase

	Week 1			Week 2			Week 3			Week 4			Week 5		
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Friday: Heavy Squat															
High Bar Squat of Front Squat or Cambered Bar Squat	1		3/fail	2		3/fail	3		2/fail	3		1/fail	2	90% of week 4	half of last week
High Bar Squat of Front Squat or Cambered Bar Squat	1		3/fail	2		3/fail	3		2/fail	3		1/fail	2	90% of week 4	half of last week
Abs of choice (optional)	2		3/fail	2		3/fail	3		2/fail	3		1/fail	2	90% of week 4	half of last week
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:			Rating:					

	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Saturday: Heavy Bench															
Wide Grip Bench or Close Grip Bench or Cambered Bar Bench	2		3/fail	2		3/fail	3		2/fail	3		1/fail	2	90% of week 4	half of last week
Wide Grip Bench or Close Grip Bench or Cambered Bar Bench	1		3/fail	2		3/fail	3		2/fail	3		1/fail	2	90% of week 4	half of last week
Vertical Pulling Move (Pulldowns or Pullups of any grip)	2		3/fail	2		3/fail	3		2/fail	3		1/fail	2	90% of week 4	half of last week
Shoulder Move (Upright Row or lateral raise of any kind)	2		3/fail	2		3/fail	3		2/fail	3		1/fail	2	90% of week 4	half of last week
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:			Rating:					

	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Sunday: Heavy Deadlift															
Deficit Deadlift or Block Pulls or Stiff-Legged Deadlift	1		3/fail	2		3/fail	2	80% week 2 weight	3,3	3		1/fail	2	50% of week 4	half of last week
Deficit Deadlift or Block Pulls or Stiff-Legged Deadlift	1		3/fail	2		3/fail	2	80% week 2 weight	3,3	3		1/fail			
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:			Rating:					

	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Monday: Lower Body Assistance															
Front Squat Close Stance High Bar or Leg Press	1		3/fail	2		3/fail	3		2/fail	3		1/fail	2	50% of week 4	half of last week
Front Squat Close Stance High Bar or Leg Press	1		3/fail	2		3/fail	3		2/fail	3		1/fail			
Low Bar Good Mornings, High Bar Good Mornings, or 45 Degree Back Raises	1		3/fail	2		3/fail	2		2/fail	2		1/fail	2	50% of week 4	half of last week
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:			Rating:					

	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Tuesday: Upper Body Assitance															
Incline/Standing/Seated Barbell Press or Incline/Flat Dumbbell Press	1		3/fail	2		3/fail	3		2/fail	3		1/fail	2	50% of week 4	half of last week
Incline/Standing/Seated Barbell Press or Incline/Flat Dumbbell Press	1		3/fail	2		3/fail	3		2/fail	3		1/fail			
Dumbbell Flyes or Overhead Triceps Extensions or Skull Crushers	1		3/fail	2		3/fail	3		2/fail	3		1/fail	2		half of last week
Barbell or EZ Bar or Dumbbell Bent Rows	2		3/fail	2		3/fail	3		2/fail	3		1/fail	2		half of last week
Shoulder Move (Upright Row or lateral raise of any kind)	2		3/fail	2		3/fail	3		2/fail	3		1/fail	2		half of last week
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:			Rating:					

Weights: All exercises should be in the 6-10 rep range unless otherwise specified, which means the first week's movement should be a weight you can do for 9-13 reps to failure if you had to. This means down sets should be around 15% lighter than top sets if the same exercise is repeated consecutively in a training day. Weights go up each week (except deload or where otherwise indicated) by 5-15lbs with the idea that they never get too heavy or not heavy enough and leave the prescribed rep range.

Exercises: Pick whichever options you feel you need most work on or will help you best improve.

Phases: Run 1-2 hypertrophy phases in a row, then move on to the strength phase. Choosing between 1 or 2 phases is determined mostly by the timing of your next meet. Mostly different exercises should be chosen for the next phase, be it hypertrophy or strength.

Strength Phase:

		Week 1			Week 2			Week 3			Week 4	
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Friday: Heavy Squat												
Low Bar Squat	2		2/fail	2		2/fail	3		1/fail	2	80% of week 3	half of last week
Low Bar Squat	1		2/fail	2		2/fail	3		1/fail	2	80% of week 3	half of last week
Abs of choice (optional)	2		2/fail	2		2/fail	3		1/fail	2	80% of week 3	half of last week
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:					
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Saturday: Heavy Bench												
Competition Bench (with Pause)	2		2/fail	2		2/fail	3		1/fail	2	80% of week 3	half of last week
Wide Grip Bench or Close Grip Bench or Cambered Bar Bench	1		2/fail	2		2/fail	3		1/fail	2	80% of week 3	half of last week
Vertical Pulling Move (Pulldowns or Pullups of any grip)	2		2/fail	2		2/fail	3		1/fail	2	80% of week 3	half of last week
Shoulder Move (Upright Row or lateral raise of any kind)	2		2/fail	2		2/fail	3		1/fail	2	80% of week 3	half of last week
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:					
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Monday: Deadlift and Lower Body Assistance												
Deficit Deadlift or Block Pulls or Stiff-Legged Deadlift	2		2/fail	2	80% week 1 weight	3,3	3		1/fail	2	50% of week 3	half of last week
Deficit Deadlift or Block Pulls or Stiff-Legged Deadlift	1		2/fail	2	80% week 1 weight	3,3	3		1/fail			
Front Squat Close Stance High Bar or Leg Press	2		3/fail	2		2/fail	3		1/fail	2	50% of week 3	half of last week
Abs of choice (optional)	2		2/fail	2		2/fail	3		1/fail	2	50% of week 3	half of last week
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:					
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Tuesday: Upper Body Assitance												
Incline/Standing/Seated Barbell Press or Incline/Flat Dumbbell Press	2		2/fail	2		2/fail	3		1/fail	2	50% of week 3	half of last week
Incline/Standing/Seated Barbell Press or Incline/Flat Dumbbell Press	1		2/fail	2		2/fail	3		1/fail			
Dumbbell Flyes or Overhead Triceps Extensions or Skull Crushers	2		2/fail	2		2/fail	3		1/fail	2	50% of week 3	half of last week
Barbell or EZ Bar or Dumbbell Bent Rows	2		2/fail	2		2/fail	3		1/fail	2	50% of week 3	half of last week
Shoulder Move (Upright Row or lateral raise of any kind)	2		2/fail	2		2/fail	3		1/fail	2	50% of week 3	half of last week
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:					

Weights: All exercises should be in the 3-5 rep range unless otherwise specified, which means the first week's movement should be a weight you can do for 5-7 reps to failure if you had to. This means down sets should be around 15% lighter than top sets if the same exercise is repeated consecutively in a training day. Weights go up each week (except deload or where otherwise indicated) by 5-15lbs with the idea that they never get too heavy or not heavy enough and leave the prescribed rep range.

Exercises: Pick whichever options you feel you need most work on or will help you best improve, unless only one option is specified.

Phases: Run 1-2 strength phases in a row, then move on to the peaking phase. Choosing between 1 or 2 phases is determined mostly by the timing of your next meet. Mostly different exercises should be chosen for the next phase, if options are given, be it strength or peaking.

Peaking Phase:

	Week 1			Week 2			Week 3			Week 4		
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Friday: Heavy Squat												
Low Bar Competition Squat	4		2/fail	2		1/fail	2		1/fail	2	225	3,3
Low Bar Competition Squat	4		2/fail	2		1/fail	1		1/fail		**DO ON SATURDAY w/bench**	
Abs of choice (optional)	2		2/fail	1		1/fail	2		1/fail			
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:					
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Saturday: Heavy Bench												
Competition Bench (with Pause)	4		2/fail	2		1/fail	2		1/fail	2	225	3,3
Competition Bench (with Pause)	4		2/fail	2		1/fail	1		1/fail			
Vertical Pulling Move (Pulldowns or Pullups of any grip)	2		2/fail	1		1/fail						
Shoulder Move (Upright Row or lateral raise of any kind)	2		2/fail	1		1/fail						
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:					
Sunday: Rest												
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Monday: Heavy Deadlift												
Deadlift (Competition Stance)	4		2/fail	2		1/fail	1	85% of last week	3,3	2	135	3,3
Low Bar Competition Squat	3	75% of Friday	3,3,3	2	75% of Friday	3,3	1	75% of Friday	3	2	135	3,3
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:					
	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps	Sets	Weight	Reps
Tuesday: Upper Body Assitance												
Competition Bench (with Pause)	3	75% of Saturday	3,3,3	2	75% of Saturday	3,3	2	75% of Saturday	3,3	2	135	3,3
Incline/Standing/Seated Barbell Press or Incline/Flat Dumbbell Press	2		2/fail	1		1/fail						
Barbell or EZ Bar or Dumbbell Bent Rows	2		2/fail	1		1/fail						
Workout Rating (1= Not bad, 2= Tough but ok, 3= Pushing the limits)	Rating:			Rating:			Rating:					

Weights: All exercises should be in the 1-3 rep range unless otherwise specified, which means the first week's movement should be a weight you can do for 3-5 reps to failure if you had to. This means down sets should be around 15% lighter than top sets if the same exercise is repeated consecutively in a training day. Weights go up each week (except the final week or where otherwise indicated) by 5-15lbs with the idea that they never get too heavy or not heavy enough and leave the prescribed rep range.

Exercises: Pick whichever options you feel you need most work on or will help you best improve, unless only one option is specified. Only assistance moves are now free, as exercises for main moves have been set as the competition lifts themselves.

Phases: Run only the peaking phase right into the meet. After a week of post-meet rest, a new hypertrophy phase should begin.

Using the Templates

As explained above, simply choose your exercises, plug in the weights with challenging but reasonable poundages (those that will keep you in the desired rep range the whole time), and run the phases. You can delete a week here or there to meet your exact schedule for your next meet. If you're not a seasoned middleweight lifter and are either more or less experienced and weigh much more or less, you can play around with the set numbers and phase duration to find what works best for you. Much more on those adjustments in the future Renaissance Powerlifting book! See you then!